1915

# THE HEATING AND VENTILATING MAGAZINE

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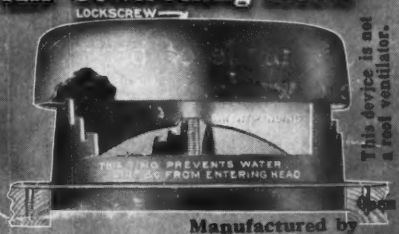


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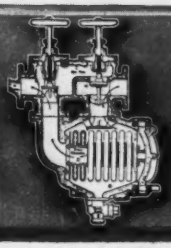

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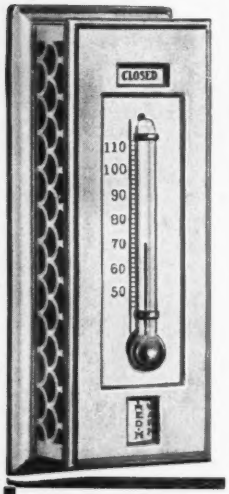


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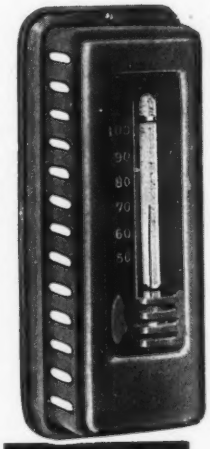

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK FEBRUARY, 1915

# *Heat Loss Test in a 200-Room Building*

RELIABILITY OF WELL-KNOWN FORMULAS BORNE OUT IN EXPERIMENTS AT UNIVERSITY COLLEGE, LONDON.

A report of a two-day test of the loss of heat from the old college building at the University College, in London, was made by C. H. Avery at the recent summer meeting of the Institution (British) of the Heating and Ventilating Engineers. The purpose of the test was to check the orthodox method of calculating heat losses and to ascertain how the results of calculations compared with the practical results of experiment. The observations were made during the week end of January 24-25, 1914, on the whole of the old college building, containing some 200 rooms.

The heating apparatus in this building, Mr. Avery stated, is more or less continuously in operation during the winter months. It is the custom to bank the fires during the night at about 8 p. m. and start them up again in the morning at about 7 a. m. This may be taken as representative of the ordinary procedure in the great majority of buildings.

It was thought, therefore, that if a comprehensive series of observations was taken of the temperature in each room, the actual amount of heating surface installed, and the temperature of each portion, the result would form a valuable indication as to whether the coefficients in general use were satisfactory.

The apparatus was operated during this test exactly as in every day use, but in order that any necessary observations might be taken without hindrance it was necessary to get control of the apparatus during the week-end, when there were no students or professors in the building.

A continuous record was kept of the outside temperature for the previous fortnight and during the test. The temperature of all heating surfaces was measured by inserting thermometer cups into the pipes and, in some cases, by running water from air cocks onto the bulbs of thermometers. In most cases the heating surfaces in this old installation consists of an inadequate amount of 3-in. and 4-in. pipe. The boilers, for the most part, are old-fashioned and made of wrought iron. In some cases, the boilers have been replaced by modern sectional boilers.

Every room in the building was carefully measured and the calculations made on the orthodox basis with considerable care.

During the test and for 24 hours before the observations were commenced the boilers were worked uniformly to a

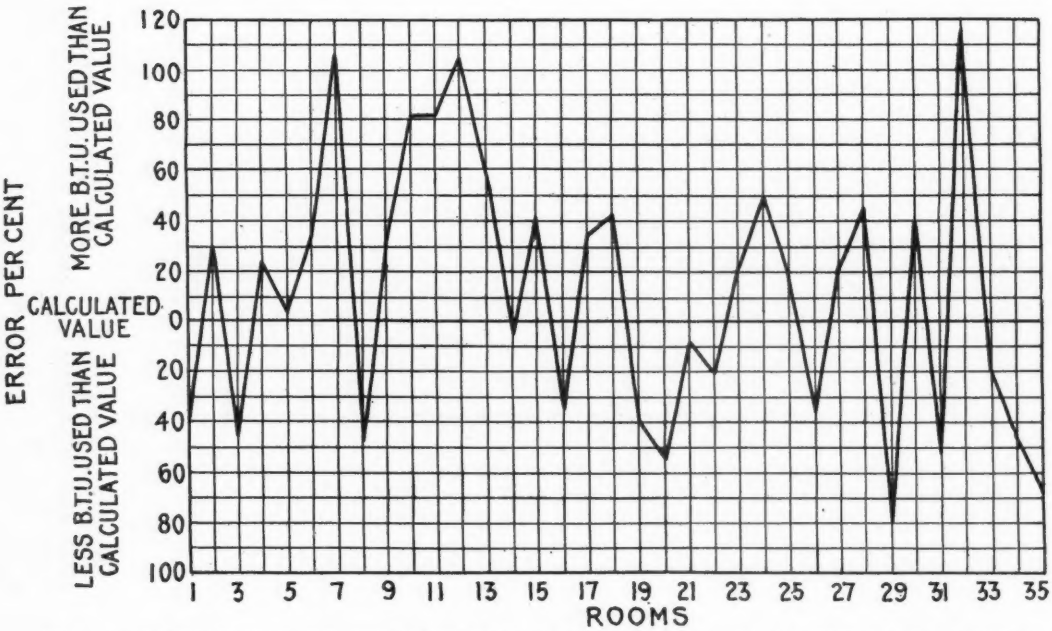



FIG. 1.—COMPARISON OF THEORETICAL AND ACTUAL HEAT LOSSES AT UNIVERSITY COLLEGE BUILDING, LONDON, SHOWING PERCENTAGE OF ERROR.

high temperature of about 180° F. on the flow pipe. The outside temperature had been fairly constant for some time before the observations were taken, thus reducing the temperature of the walls to a uniform value. Careful observations were taken at intervals of the interior temperatures in each room. These temperatures were found to be fairly constant through the week-end. Records were kept of these and the rise of temperature calculated.

Calculations of heat loss were in the first place made for the orthodox difference of 30° F. (which is English practice), with two interchanges of air per hour. Each of these heat losses was then reduced in the proportion of 30° to the actual rise observed, thus obtaining the theoretical heat loss under the

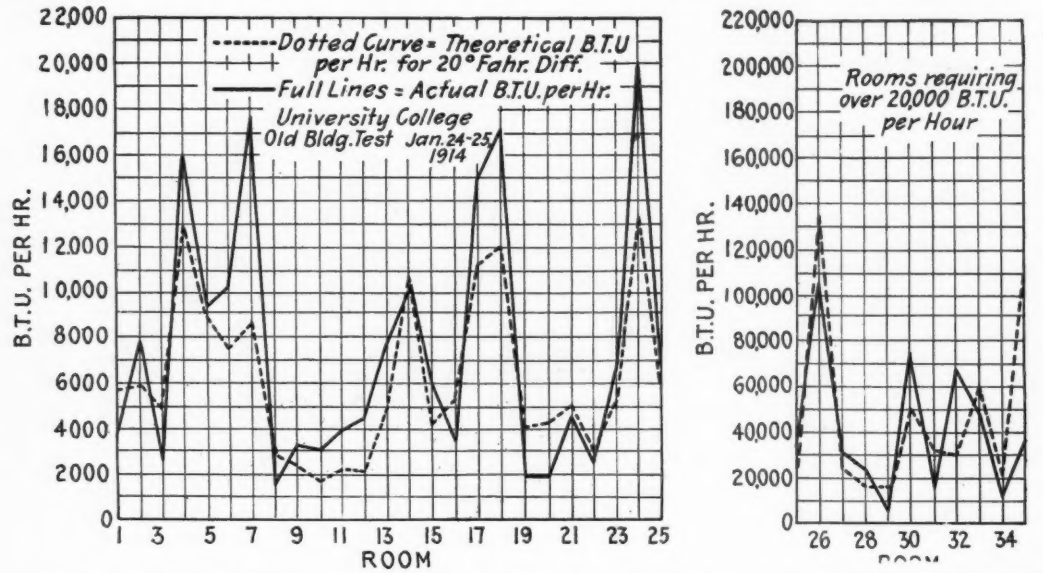



FIG. 2.—COMPARISON OF THEORETICAL AND ACTUAL HEAT LOSSES, SHOWING DIFFERENCES IN B.T.U.

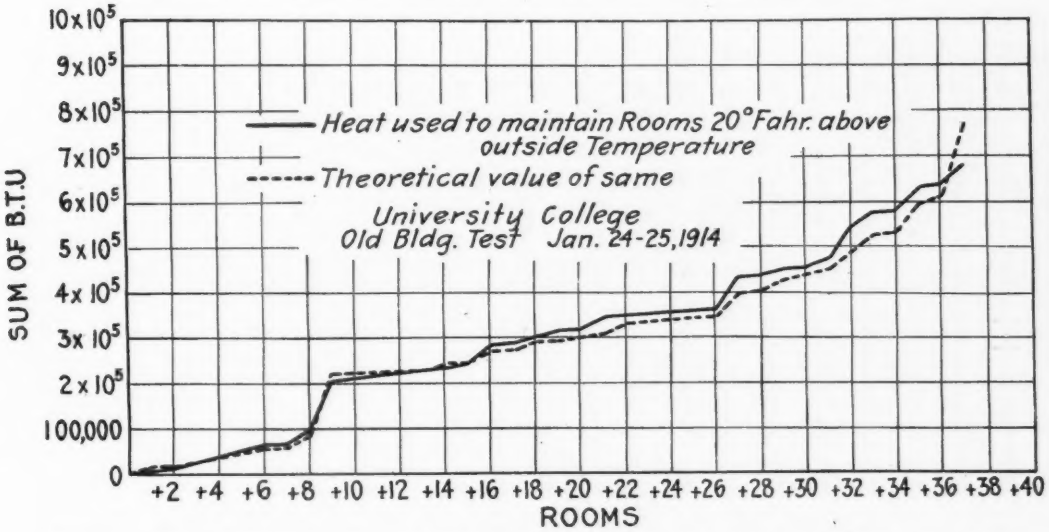



FIG. 3.—SUM CURVES OF THE HEAT REQUIRED AND CALCULATED FOR ALL THE ROOMS.

actual conditions observed. This figure was compared with the heat loss from the pipes, as calculated. Each length of each size pipe was measured with a tape, and the temperature of each length was also observed and the heat loss calculated from standard coefficients.

We have thus means of comparing the heat theoretically lost from the building with the heat given off by the hot pipes to the building. This comparison is plotted in Fig. 1. It will be noticed that each point on the horizontal axis of coordinates has reference to one particular room. The irregularity of the curves is partly due to the widely different sizes of the various rooms and the author also states that no account was taken of the accession of heat from adjacent rooms, which, he says, would have a bearing on these variations.

The author also showed two sum curves (Fig. 3) of the heat required and calculated for all the rooms. These curves give a much better idea of the relation between practice and calculation. It will be seen that the agreement is fairly close. This does not mean, said Mr. Avery, that the figures are theoretically correct but only that they served as a reliable guide in practice.

The speaker also pointed out that no tests were made of the actual interchange of air in the rooms; it was simply assumed to be twice per hour. Any large variation from this figure would, of course, vitiate the results.

*EDITOR'S NOTE.—In another portion of the report, Mr. Avery refers to the formulas of Rietschel, Barker and Carpenter. In the Rietschel formula the heat lost through the walls, etc., in B.T.U. per hour is equal to the net area of surface, multiplied by the temperature difference, multiplied by a coefficient K, depending on the character of the building material. This is for continuous heating. When the space is intermittently heated an addition is made to the heating figures. A room, for instance, which requires W, B.T.U. under constant conditions of temperature, if left unheated for n hours during every 24 hours, will require an additional provision as follows:

$$Z = \frac{0.0625\ (n-24)}{Z} W,$$

where Z equals hours of heating up. A further allowance is made for more than one air change per hour.

The Barker formula, allowing for two air changes per hour, is given as: Heat loss = actual glass area + (outside wall area ÷ 4) + (ceiling area ÷ 6) + (floor area ÷ 10) + (inside wall area ÷ 8) + (contents of room ÷ 30). For the interrupted heating Mr. Barker allows 15% of the total B.T.U.

The well-known Carpenter formula which Mr. Avery quotes is as follows, allowing for two air changes per hour: Heat loss = 1.5 [G + (OW ÷ 4) + (IW ÷ 8)], OW representing outside wall or roof surface and IW, inside wall surface. The 1.5 accounts for the two air changes per hour. No reference is made to any additions for intermittent heating, but the results obtained with this formula, as used by Mr. Avery, agreed fairly closely with those of Rietschel and Barker, after allowances had been made in the two latter for heating up.

LABORATORIES OF THE LUBIN MFG. CO., AT BETZWOOD, PA.

# *Air Conditioning in a Moving Picture Laboratory*

EQUIPMENT OF PLANT OF THE LUBIN MANUFACTURING COMPANY.

The problems of photography presented in the reproduction, from the master negative, of moving-picture films, are the same with which every amateur is familiar, but in addition there are many more which result from large scale production and the special nature of the industry.

The Lubin Manufacturing Company in its plant at Betzwood, Pa., has made an effort to bring under control all the factors affecting their product, and neither time nor expense has been spared to make it the most complete photographic laboratory in existence.

An important phase of their problem, of interest to engineers, is represented in the elaborate system of air conditioning designed to bring atmospheric conditions under control. While it is true of almost every series of industrial processes that one or more can be accomplished to best advantage at times when certain atmospheric conditions prevail, it is especially true in the fabrication of moving picture films on account of their sensitiveness to temperature and humidity.

## DIFFERENT PROCESSES IN MAKING MOVING PICTURE FILMS.

The major processes entering into the production of a moving picture film, are:

1. Perforating, in which the edges of the film are punched to fit the standard projecting lanterns.

2. Printing, in which the various scenes are printed from the master negative upon the unexposed film. This, of course, is done mechanically.

3. Developing, in which the films are reeled upon frames and the whole dipped into the developing bath, etc.

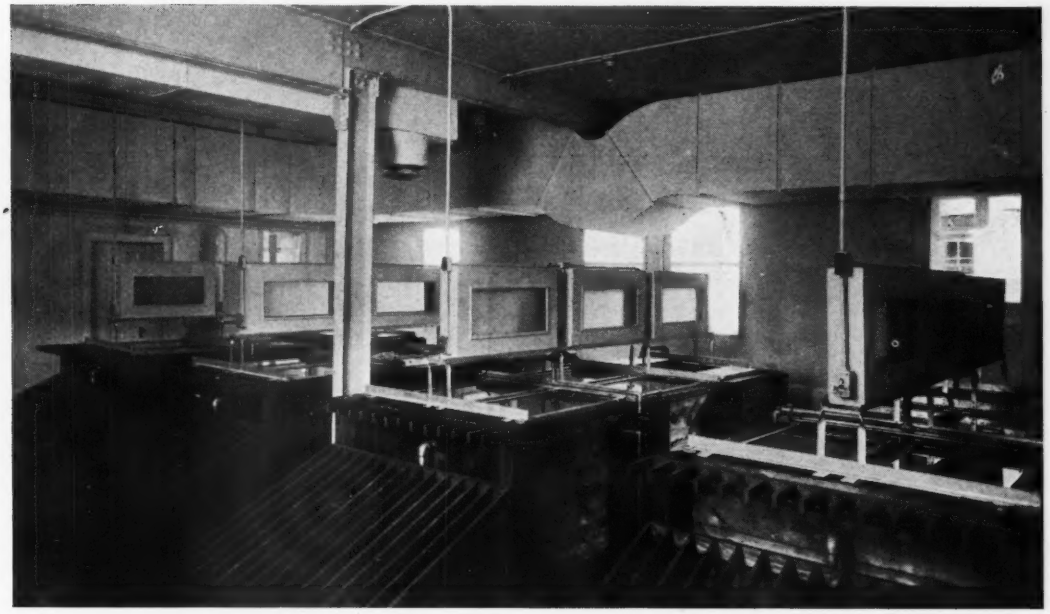
4. Washing, in which the films are subjected to a rather protracted spraying of fresh cold water.

5. Drying.

6. Joining, in which the various scenes, leaders, etc., are assembled and joined to form the continuous film.

## DIFFICULTIES DUE TO ATMOSPHERIC CONDITIONS.

Among the evils due to atmospheric influences, are: 1. The tendency of the film to curl if subjected to too high a temperature. It is obvious that if this occurs prior to or during the perforating or printing operation or during the drying, the picture when projected upon the screen will be distorted. 2. Premature erosion of negatives and lack of clearness of the finished film, due to the presence of dust in the air. 3. Uncertain rate of drying, especially during summer, owing to the low temperature at which drying must be carried on. 4. Unfavorable working conditions for employees in the dark rooms, especially in hot weather, owing to the production of much heat in the operation, which necessitates rapid ventilation and consequently in much dirt being brought in. Under certain conditions production is



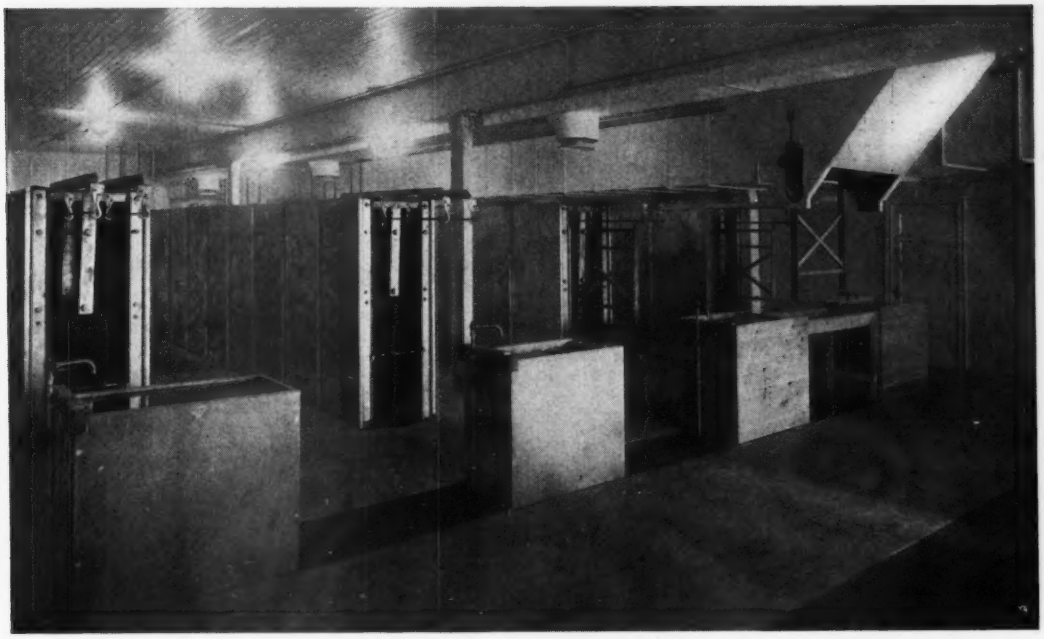
PART OF DEVELOPING ROOM, LUBIN MOVING PICTURE LABORATORY.

greatly curtailed if not completely stopped.

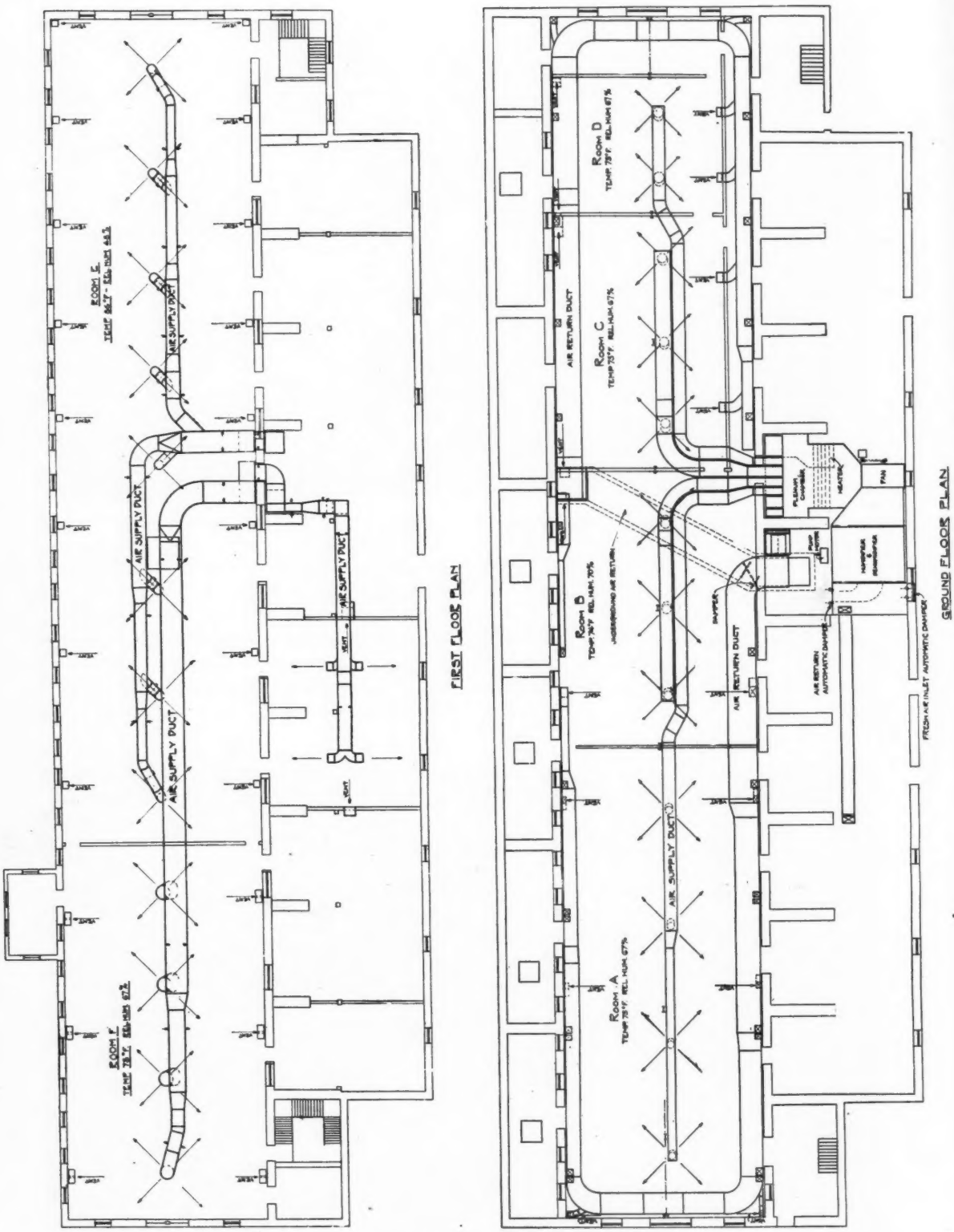
The complete adaptability of air conditioning equipment to such conditions is at once apparent, and in fact has actually eliminated the troubles enumerated.

SYSTEM OF VENTILATION AND AIR CONDITIONING.

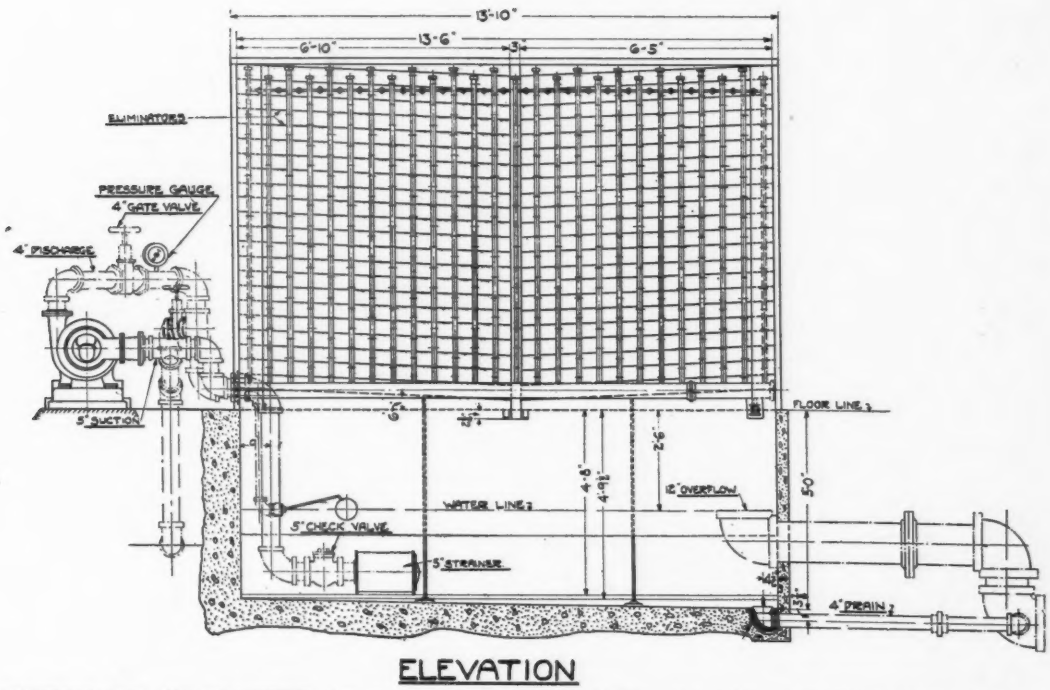
In brief the system of ventilation and air conditioning includes an air washer used as a humidifier during a portion of the year and as a de-humidifier and cooler the remainder; a fan drawing air through



WASHING ROOM, LUBIN MOVING PICTURE LABORATORY.




GROUND AND FIRST FLOOR PLANS OF PLANT OF LUBIN MFG. CO., SHOWING LAYOUT OF AIR CONDITIONING SYSTEM.

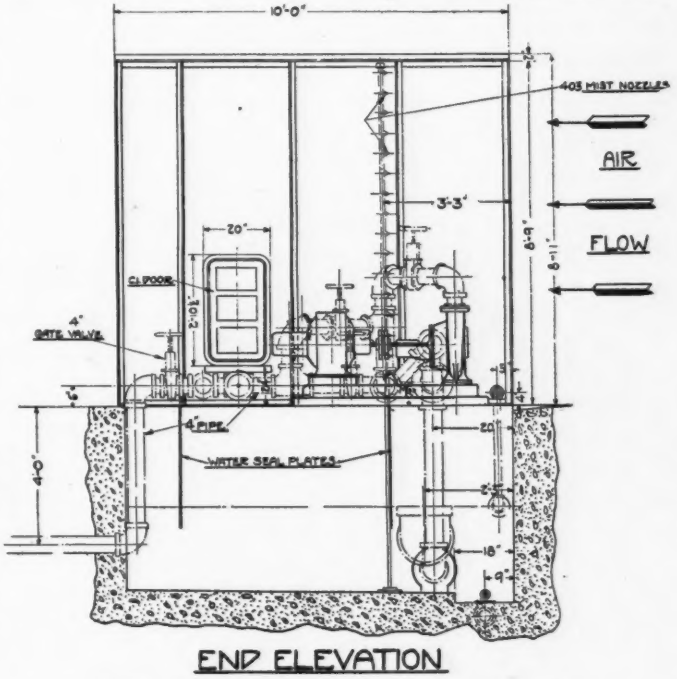



DESIGN OF AIR WASHER AT PLANT OF LUBIN MFG. CO., FOR HUMIDIFYING AND ALSO FOR DEHUMIDIFYING AND COOLING THE AIR.

the air washer and discharging through a heater and by-pass into a plenum chamber from which separate supply ducts are taken to the various rooms. Air recirculating ducts are provided, which discharge into a suction chamber, at which point the requisite amount of fresh air is introduced to the system, the mixture passing into the washer and so completing the cycle. Thermostatic temperature regulation is also provided.

The air washer used, furnished by Warren Webster & Co., Camden, N. J., is known as the "Type B," a design especially adapted to the use of a refrigerating medium for cooling or de-humidifying air. This apparatus is built of heavy gauge galvanized American Ingot iron and has a capacity of 50,000 cu. ft. of air per minute. The air washer consists of a casing 8 ft. 11 in. high, 13 ft. 10 in. wide and 10 ft. deep, forming the spray chamber and enclosing an eliminator and spray system, the whole set over a concrete tank.

The air is brought into contact with



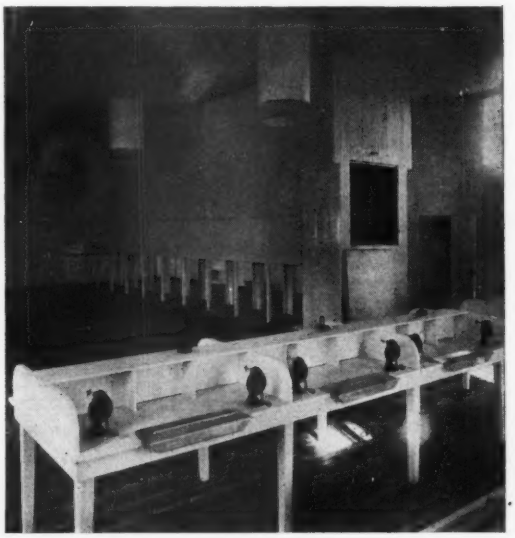

END ELEVATION OF AIR WASHER FOR PLANT OF LUBIN MFG. CO.

the spray water in the form of a finely divided mist and fog issuing from a series of brass spiral mist nozzles uniformly spaced over the entire spray chamber area. These nozzles discharge 500 gals. of water per minute at 20 lbs. pressure against the direction of air flow. This arrangement, with the long spray chamber, was made to secure perfect contact between air and water, a feature of great importance in view of the use of cold artesian well water as the refrigerating medium in this case.

After contact with the sprays the air passes into the eliminator of the air washer, where it is deflected four times to remove all entrained moisture. The eliminator consists of a series of baffles spaced about 3 in. on centers, with lips on each to increase the separating efficiency. The wide spacing of the baffles renders the entire eliminator accessible for cleaning and inspection.

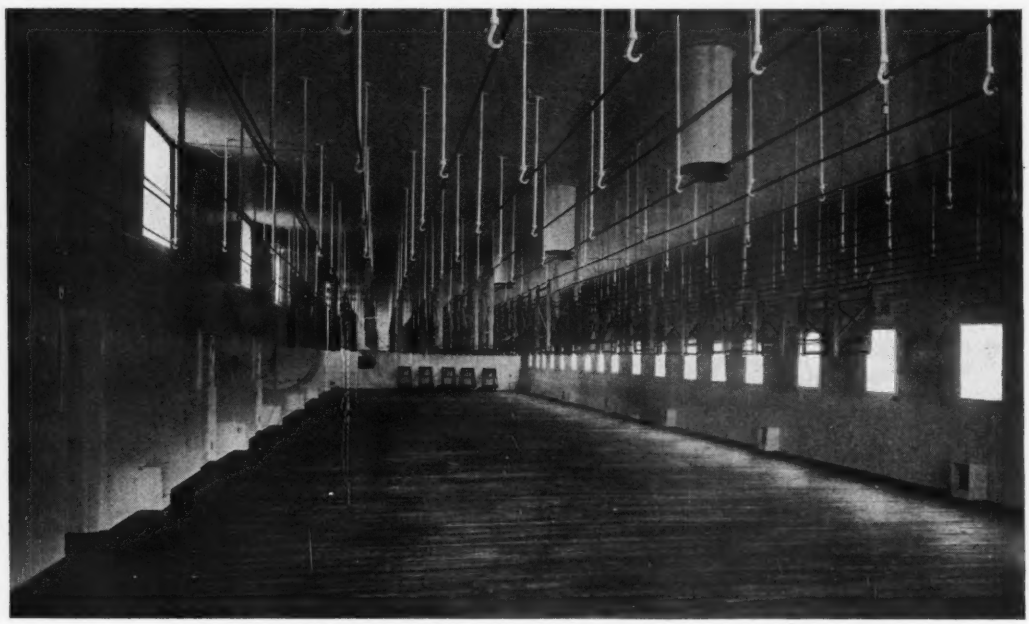
The spray water, after use, falls into the concrete tank, whence it is recirculated as required, the excess passing out the overflow to sewer.

For maintaining the required pressure of 20 lbs., on the spray nozzles, there is provided a Platt single-suction centrifugal pump, direct-connected by means of a flexible coupling to a 20 H.P., 220 volt, 2-phase, 60-cycle Westinghouse motor, all mounted on a cast-iron base plate with oil rim around same. Ample safety margin was allowed in this as in all other motors owing to the continuous service required at certain times of the year.



JOINING ROOM, PLANT OF LUBIN MFG. CO., SHOWING CONVEYOR FROM WASHING ROOM TO DRYING ROOM.

The fan is a three-quarter housing Sirocco unit, driven, through a silent chain, by means of a 35 H.P. motor of make and characteristics the same as the air washer motor.



DRYING ROOM, PLANT OF LUBIN MFG. CO.

The heater is built in two parts, one for the dry room and the other for the balance of the plant.

The air supply duct system is run overhead, the duct for each room being carried through the center of same. Outlets are taken off the bottom of the ducts and the air is discharged against adjustable, conical diffusers.

Rooms are vented through outlets near the floor, each outlet being provided with hand dampers. The supply ducts, in addition to hand dampers, are provided with mixing dampers at the plenum chamber, automatically controlled by Johnson thermostats placed in each room. Thus the temperature and rapid displacement of the air in each room is maintained constant.

Among the rooms treated are: The perforating room, printing room, developing room, washing room, dry room, titles room, joining room, negatives room. Each of these rooms is maintained constantly at different temperatures and relative humidities. In some rooms it was found necessary to supply an air volume effecting an air change of more than 20 times an hour in order to maintain the desired temperature during the warmest summer weather.

When the outside air condition exceeds a certain pre-determined point, cold well water of the required volume is circulated in the air washer, automatic control of the cold water injection being effected thermostatically. In addition, appromimately 95% of the air is recirculated, provided the outside wet-bulb temperature exceeds that of the return air, otherwise all air is taken from outside. When, however, the outside wet-bulb temperature is below the predetermined point, the spray water is entirely recirculated and a portion of the air recirculated, varying from 10%, in coldest weather, to 45%. The mixture of fresh and return air is automatically controlled by dampers operated thermostatically.

INSPECTION ROOM, PLANT OF LUBIN MFG. CO.

This method of operation secures the utmost economy of cold water in summer and of steam for heating and humidifying during the colder seasons.

The entire air conditioning equipment was designed by Warren Webster & Co. in conjunction with Edward L. Simons,

consulting engineer for the Lubin Company. Bowers Brothers & Co., Philadelphia, Pa., were the contractors and the results of their efforts are worthy of special mention as the workmanship is considered practically perfect to the smallest detail.

The Lubin Manufacturing Company is to be congratulated on their enterprise, which, happily, has resulted in greater speed, facility, economy and quality of production.

The installation is of special interest to both engineers and manufacturers in that it is a recognition of the important bearing which atmospheric conditions have upon industrial processes generally, and an extension of the ever expanding field for the application of air conditioning apparatus.

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# *A Study of Heating and Ventilating Conditions in a Large Office Building*

C. E. A. WINSLOW* AND G. F. MAGLOTT.

(*Presented at the annual meeting of The American Society of Heating and Ventilating Engineers, New York, January 20-22, 1915.*)

The progress of the art of heating and ventilation has been seriously retarded by the gap which unfortunately often exists between design and operation. Excellently planned systems may fail on account of changes in conditions of occupation or carelessness in upkeep and management; while, on the other hand, operation sometimes reveals shortcomings in design which should be instructive in the planning of future installations. Careful studies of the actual results obtained in practice from the operation of heating and ventilating plants are none too common. The results of such a study of a large business office building in New York City may therefore be of some interest. The authors had the advantages of the advice of Mr. D. D. Kimball as consultant in the course of the investigation.

### THE SYSTEM OF TEMPERATURE CONTROL.

The building is heated in the main by direct steam radiation although certain rooms on the lower floors are in part indirectly heated by plenum air supply. The steam in the heating coils is maintained under ½-lb. pressure against a 1-in. vacuum.

The radiators in certain sections are hand controlled, in other sections thermostatically controlled. Of the workrooms examined by our inspectors, 65 had hand-control and 46 thermostatic control; of the offices 39 had thermostatic control and 82, hand-control. The thermostats in use are of an old type and are in a state of general disrepair. Of 213 thermostats individually examined, 110 or 52% were not controlling their radiators. A considerable part of the trouble was obviously due to interference with the instruments on the part of clerks who, dissatisfied with existing temperature conditions, have attempted to set them right without understanding the mechanism with which they were tampering.

### TEMPERATURE AND HUMIDITY CONDITIONS IN OFFICES AND WORKROOMS.

During the period between January 25 and May 17, 1914, our inspectors made 2,045 determinations of temperature and humidity by the use of the sling psychrometer in practically all the offices and workrooms ocupied by the company.

The humidity results were not particularly significant, merely showing that as usual the indoor humidity varied directly with the outdoor temperature. During most of February and the first half of

*Curator of Public Health, American Museum of Natural History; Chairman New York State Commission on Ventilation.

March the humidity in the building was under 30% of saturation, in the last half of March and in April it fluctuated between 30 and 40% and in May it rose above 40%.

The temperature data were of course of much greater practical importance. The average weekly temperature for the building never fell below 69° F. during the whole period studied. Out of the 16 weeks covered by our investigation, four showed averages between 69° and 70°, ten averages between 70° and 72°, one an average of 73.5° and one an average of 75°.

Fifty-eight per cent. of the individual rooms studied showed a temperature of 71° or less; thirty-four per cent. were between 72° and 75°; nine per cent. were between 76° and 81°. The distribution of observations is shown graphically in Fig. I, the hand controlled and thermostatically controlled rooms being plotted separately. For comparison we have included the distribution of 143 temperature records made by Professor Baskerville and the senior author in a well managed public school, School 33, the Bronx, New York City.

The curves in Fig. I bring out two points; first, that the office building as a whole is greatly overheated as compared with such a constant low temperature as is maintained in School 33 (in which 97% of all records were under 72° F.); and second, that overheating is even slightly greater in the thermostatically-controlled than in the hand-controlled rooms. The moral is that overheating is likely to be general either where hand-control alone is relied upon or where a thermostatic system has been allowed to fall into disrepair.

In addition to the sling psychrometer determinations we obtained continuous records of temperature by means of Tycos thermograph in twenty-five different rooms, usually for a two weeks' period in each room. The record for one of the most overheated rooms in the building is reproduced in Fig. 2 to show how bad conditions may become. This particular room had three thermostats, all in bad condition; and for a period of twenty-one days, between February 28 and March 24, the temperature never once fell as low as 70° F. during working hours, and was usually in the neighborhood of 80°.

THE SERIOUSNESS OF OVERHEATING.

It is perhaps hardly necessary before this society to dwell upon the importance of such conditions of overheating as those recorded. It has again and again been shown that the most serious of the effects experienced as a result of bad air conditions are due not to chemical poisons, but to high temperature. The recent studies of the New York State Commission on Ventilation furnish striking evi-

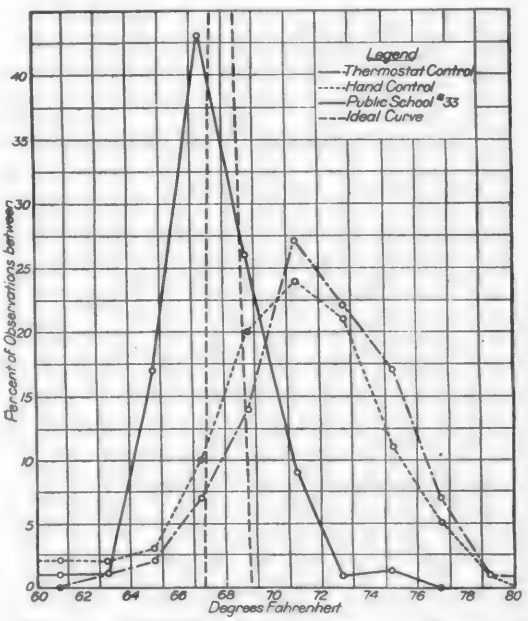



FIG. 1.—TEMPERATURE OBSERVATIONS IN LARGE NEW YORK OFFICE BUILDING FROM JANUARY 25 TO MAY 17, 1914.

dence of the bad effects of high temperatures upon the heat-regulating system of the body as shown by rise in body temperature and fall in blood pressure and by the decrease in mental and physical work done in overheated rooms. There can be no doubt that the clerks exposed to such conditions as those observed are injured in health and hampered in efficiency thereby.

THE VENTILATING PLANT.

Considerable areas in the sub-basement and basement and a few company offices and workrooms on the first, second and third floors are equipped with plenum air supply. The rest of the building has either an exhaust system alone or no artificial ventilation at all. About 44%

of the workroom area comes under the latter head.

It may be generally assumed that when an office or workroom is so crowded that the floor area is less than 200 sq. ft. per capita, efficient artificial ventilation will be necessary. Of all the workrooms occupied by the company we found that 90% have less than 200 sq. ft. per capita, 78% less than 100 sq. ft. and 31% less than 50 sq. ft. The provision of only 56% of the workrooms with any artificial ventilation at all is therefore the first serious defect indicated.

The 56% of the workroom area which does have artificial ventilation depends almost wholly upon the exhaust system. This system consists of six separate shafts, one of which is much larger than the others. Each shaft is of graduated cross section carried up through the building to a fan room at the roof. Two of the shafts (IV and VI) are lined with sheet metal, the others are of plaster on metal lath carried on light steel shapes. All the fans are of the propeller type operated by direct connected electric motors, controlled by rheostats. All the fans were found to be operated at a reduced speed in accordance with orders of the chief electrician.

The general engineering data obtained in regard to the operation of these ducts are indicated in Table 1. We have estimated the probable population on each shaft in 1,925 as indicated by the past growth of the business and have tabulated the work done by the fans as at present operated and when operated under our direction at full speed.

Our results indicate that with the present population all the shafts but II are exhausting over 30 cu. ft. per capita and may be considered satisfactory. Shaft III, however, is close to the limit and Shaft II is already inadequate.

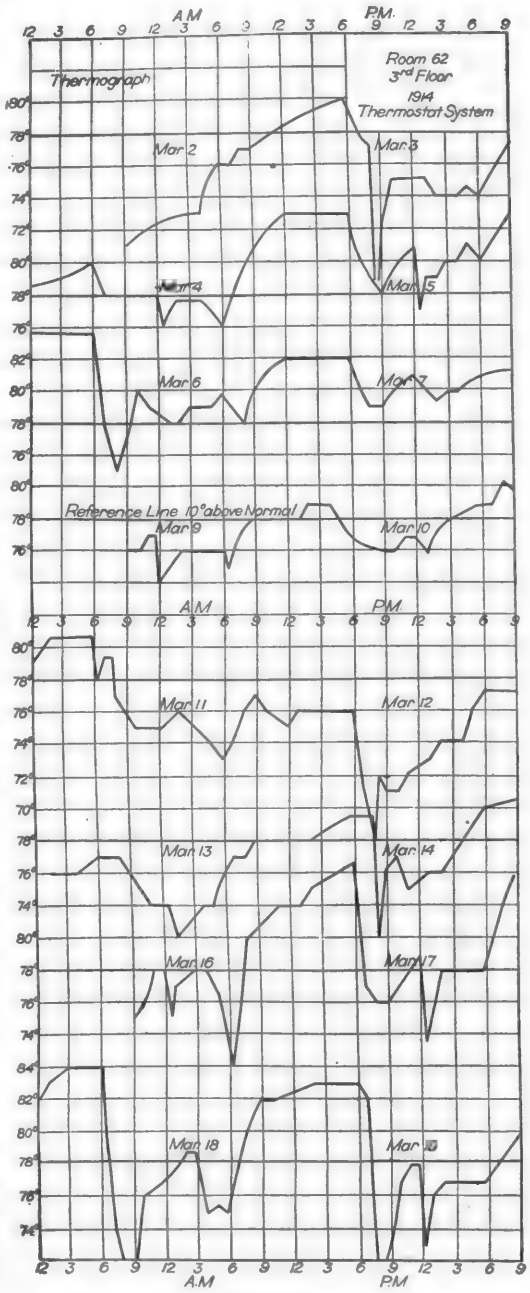



FIG. 2.—TEMPERATURE RECORDS FOR ONE OF THE MOST OVERHEATED ROOMS, NEW YORK OFFICE BUILDING.

ROOM REGISTER OPENINGS AND PER CAPITA AIR SUPPLY.

The most serious defect of the ventilating system we found to lie in the generally inadequate room register openings which in many cases prevent the main ducts from effecting a change in the rooms which need it most. In order to remove the standard air quantity of 30 cu. ft. (per minute) per capita with the register velocities practically attainable it is necessary to have a register area of about 0.1 sq. ft. per capita. A detailed study of 74 workrooms showed that in 23 cases or 31% the register area was less than 0.075 sq. ft. per capita, in 12 cases or 16% between 0.075 and 0.125 sq. ft., in 16 cases or 22% between 0.125 and 0.200 sq. ft., in 8 cases or 11% between 0.2 and 0.3 sq. ft., in 13 cases or 18% be-

TABLE I.—SHAFT AND FAN CAPACITIES.

| | Shaft No. | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| Population— | | | | | | |
| Present | 437 | 533 | 411 | 483 | 25 | 1,100 |
| 1925 | 700 | 870 | 670 | 790 | 40 | 1,810 |
| Shaft area top, sq. ft. | 27.3 | 16.2 | 16.5 | 18.0 | 11.7 | 70.5 |
| Present speed*— | | | | | | |
| R. P. M. | 368 | 334 | 240 | 225 | 476 | 112 |
| Velocity ft. per min. | 475 | 500 | 485 | 1,100 | 410 | 733 |
| Q | 12,950 | 8,100 | 8,000 | 20,000 | 4,800 | 51,700 |
| Full speed— | | | | | | |
| R. P. M. | 438 | 450 | 418 | 268 | 600 | 160 |
| Velocity ft. per min. | 570 | 740 | 795 | 1,310 | 490 | 970 |
| Q | 15,500 | 12,000 | 13,100 | 23,600 | 5,700 | 68,300 |
| Q per capita— | | | | | | |
| Present | 36 | 23 | 32 | 49 | 228 | 62 |
| 1925 | 22 | 14 | 20 | 30 | 142 | 38 |
| Rated or theoretical, Q | 20,000 | 25,000 | 15,000 | 37,000 | 5,000 | 75,000 |
| Rated H. P. | 5 | 5 | 5 | 6¼ | 1¼ | 11½ |
| Diameter fan, inches | 48 | 48 | 48 | 72 | 30 | 120 |
| Capacity of shaft*— | | | | | | |
| Total Q | 21,800 | 13,000 | 13,200 | 14,400 | 9,400 | 56,200 |
| Q per capital, 1925 | 31 | 15 | 20 | 18 | 235 | 31 |

*Figures based on a velocity of 800 ft. per minute as limited by type of fan. With a different type of fan the capacity of the shaft would be doubled.

tween 0.3 and 1.0 sq. ft., and in 2 cases or 3%, over 1.0 sq. ft. This means that the relation of register area to room population under present conditions of occupancy has become quite haphazard, that 31% of the workrooms have less than the proper allowance of register area while others have far too much.

Determination of the actual flow of air at the exhaust registers was made with the anemometer on 148 different occasions in one or another of the fan-ventilated workrooms, practically all of them being covered at least once. Ten rooms or 7% showed a negative pressure (the supposed exhaust acting as a supply), 47 or 32% showed less than 10 cu. ft. per capita, 32 or 22% between 10 and 20 cu. ft. per capita, 18 or 12% between 20 and 30 cu. ft., 11 or 7% between 30 and 40 cu. ft. and 30 or 21% over 60 cu. ft. per capita. Thus in 89 cases out of 148 or 61% the air exhaust was quite inadequate, being less than 20 cu. ft. per capita, in 29 cases or 19% it was between 20 and 40 cu. ft., a reasonable amount; while in 30 cases or 22% it was over 40 cu. ft., or far in excess of necessary requirements.

It was interesting to note that by far the worst conditions were found upon the upper floors. In the lower stories the exhaust was usually adequate, while in the upper stories the amount of air drawn out progressively decreased. On two of the shafts the suction above the seventh and eighth floors respectively was either negligible or was replaced by a positive outflow of air into the room, vitiated air from the lower workrooms being forced out into the upper ones (Fig. 3).

DETERMINATION OF CARBON DIOXIDE.

In order to measure the actual extent of air change within the offices and workrooms we made 228 determinations of carbon dioxide, using the standard Peterson-Palmquist apparatus. Of the 228

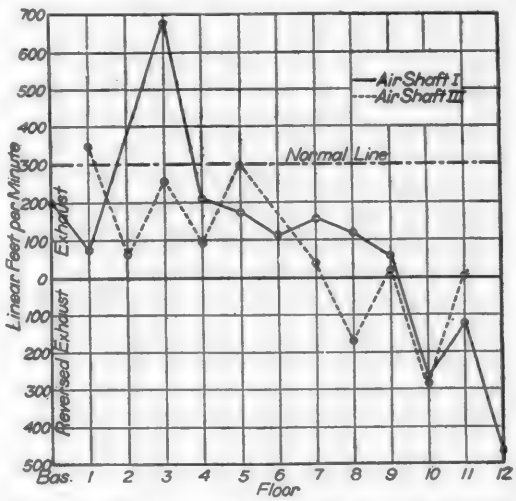



FIG. 3.—DETERMINATIONS OF AIR FLOW AT EXHAUST REGISTERS.

records 58% were below 9 parts per 10,000, 32% between 9 and 12 parts, and 12% over 12 parts, indicating that air change was inadequate in over 40% of the cases studied.

As shown in Fig. 4, the worst results were of course in the worst crowded rooms. It will be noted that taking 8 parts of carbon dioxide as a reasonable limit only one excessive value was recorded in a room with over 200 sq. ft. of floor space per capita.

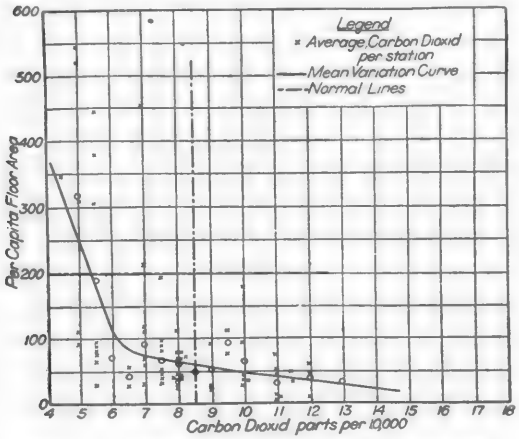



FIG. 4.—CARBON DIOXIDE MEASUREMENTS IN OFFICES AND WORKROOMS OF NEW YORK OFFICE BUILDING.

Fig. 5 shows the relation between carbon dioxide and air movement at the register openings and it will be noted that only one high value was obtained where the air exhaust was over 30 cu. ft. per capita. Mean carbon dioxide values increased progressively in passing upward from floor to floor.

The actual air conditions in the workrooms were of course controlled not only by the exhaust system, but also by the extent to which windows were kept open. In Fig. 6 the observed carbon dioxide values are plotted against the area of open window space in the respective work-

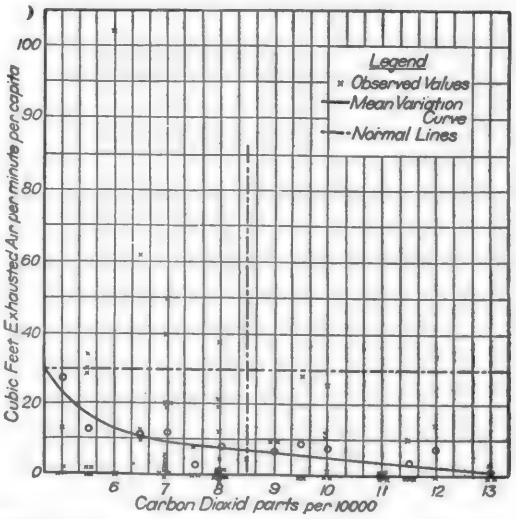



FIG. 5.—RELATION BETWEEN CARBON DIOXIDE AND AIR MOVEMENT AT REGISTER OPENINGS.

rooms at the time expressed in square feet per capita. The relation is seen to be a very close one. With an open window area of over 0.5 sq. ft. per capita, not a single high carbon dioxide value was recorded and only six values were obtained with an open window area equal to 0.25 sq. ft.

Table 2 shows the carbon dioxide values obtained, classified according to the condition of the respective workrooms in regard to both exhaust ventilation and extent of window openings. The table indicates clearly that with an adequate exhaust and open windows conditions are always excellent, that with either adequate exhaust or open windows intermediate conditions are obtained while results are generally bad when neither natural nor artificial ventilation is available.

SPECIAL PROBLEMS OF LUNCH ROOMS AND AUDITORIA.

On the two upper floors are two large lunch rooms and several small lunch-

TABLE II.—RELATION OF ARTIFICIAL AND NATURAL VENTILATION TO AIR CONDITIONS.

| Carbon Dioxide, parts per 10,000.... | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rooms with exhaust over 30 cu. ft., window openings over .25 sq. ft. p. c. | 5 | 9 | 8 | 6 | 2 | | | | | | | | |
| Rooms with exhaust over 30 cut. ft., window openings under .25 sq. ft. p. c. | | 1 | 1 | 2 | 1 | 1 | | | | | | | |
| Rooms with exhaust under 30 cu. ft., window openings over .25 sq. ft. p. c. | | | 12 | 14 | 11 | 2 | 2 | | 1 | 1 | | | |
| Rooms with exhaust under 30 cu. ft., window openings under .25 sq. ft. p. c. | 1 | 1 | 3 | 6 | 6 | 4 | 13 | 11 | 5 | 6 | 2 | | 1 |

rooms for the clerical force, and a large auditorium.

The register areas serving the lunchrooms were found to be so inadequate as to be practically negligible and the flow of air through them was slight or even reversed in some cases. Of twenty-three temperature records during lunch hours, four were between 72° and 73 degrees, seven between 74° and 75°, six between 76° and 77°, and six between 78° and 79°. Of twenty-three carbon dioxide observations one was 8 parts, eight 10 parts, two 11 parts, three 13 parts, two 14 parts, three 15 parts, and one 20 parts. In the auditorium conditions were even worse.

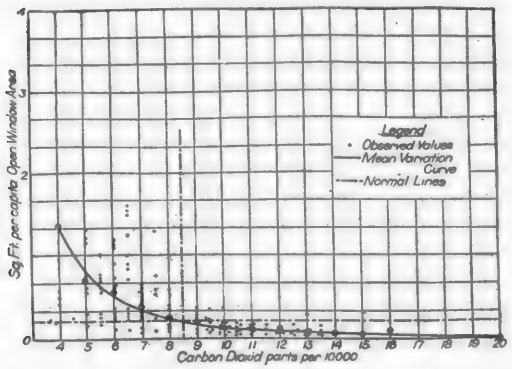



FIG. 6.—RELATION BETWEEN CARBON DIOXIDE AND AREAS OF OPEN WINDOW SPACES IN WORKROOMS.

This room has a fan and supply and exhaust ducts adequate to all demands, but the motor is too small to operate the fan at full speed and the register openings for both incoming and outgoing air are located far above the heads of the occupants. the air enters at the ceiling about 21 ft. above the floor and leaves about 16 ft. above the floor, so that the occupants are not materially benefited. Observations made on five different occasions when the room was in use gave temperature averages of 68°, 75°, 87°, 87° and 87°, and carbon dioxide values of 12, 10, 8, 20 and 13 parts, respectively.

GENERAL CONCLUSIONS AS TO VENTILATION.

According to the standard of 200 sq. ft. of floor area per capita, which we consider a reasonable one, 90% of the workrooms in this building are so crowded as to be in need of artificial ventilation. Out of 118 workrooms studied 41 or 35% had no artificial ventilation at all. Of those which were provided with exhaust ventilation, the per capita air movement was inadequate in 61% of the cases studied. Adding to the 35% of the rooms which have no artificial ventilation, 61% of the other 65%, or 39% of the total, we find that 74% of all workrooms are either not ventilated or ventilated insufficiently. Carbon dioxide determinations confirm this general conclusion, indicating poor air conditions in 42% of the rooms studied. In certain cases, of course, window ventilation made good the lack of artificial ventilation.

Only by either (a) artificial ventilation exhausting at least 30 cu. ft. per minute per capita or (b) an area of open windows equal to at least 0.25 sq. ft. per capita could reasonably low carbon dioxide values be obtained. The usefulness of window ventilation is greatly limited by local and climatic conditions. In warm weather there is no force to drive air in through the windows; in cold weather drafts are objectionable and windows are closed; and at all times the noise and dust of the city streets constitute serious objections. The inadequate artificial ventilation of the building is made obvious to the senses in many of the workrooms by the stale, stuffy odor characteristic of foul air.

In general, then, our investigation showed that both the heating and the ventilating systems had been allowed to fall into such disrepair and to become so ill adjusted to present needs as to fall far short of realizing the purposes for which they were designed. It is just such conditions as these which constantly bring discredit upon the art of heating and ventilation, conditions which can only be brought to light by a comprehensive engineering and sanitary study of actual operation.

# District Heating

By S. Morgan Bushnell and Fred B. Orr.

## II.—Metering.

(*This series of articles commenced in the January, 1915, issue.*)

No other factor is contributing more to the present progressive state of the heating industry, or promising more for its continued prosperity, than that of metering the heat supply. Those early pioneers who first launched this industry evidently possessed sufficient foresight to perceive the essential dependence of its ultimate growth and extension upon some such basis as metering.

Accordingly, we learn that the first inventions of steam measuring devices were contemporaneous with or immediately antecedent to the first systems of heat distribution installed. Indeed, the first available records point to the fact that the father of the steam meter was Birdsill Holly, who, as noted in last month's article, worked out a system which still remains, with various modifications, the basis of the industry as we find it to-day.

Appreciating the fact that it would be more equitable to both company and consumer if the quantity of service could be

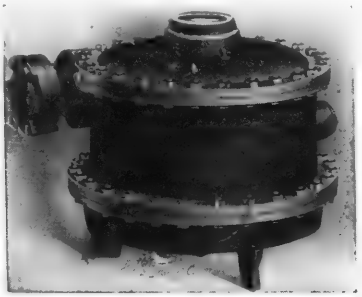


FIG. 1.—THE HOLLY METER.

measured, he made application November 29, 1880, for a patent on meters, which was granted May 10, 1881. While it is barely possible, as so frequently happens, that some other inventor was at work simultaneously upon a similar device, no record of such appears, and to Mr. Holly is due the credit for consummating his idea by the actual construction of this meter. It is interesting to note here that in all probability this invention antedates by a few years the first Edison electric chemical meter, which was used quite extensively in the early days of incandescent lighting. This furnishes another instance pointing to the priority of the introduction of central heating over its closely allied industry, central electrical systems.

Briefly, the essential features covered in the Holly patent are as follows:

"This invention relates to improvements in meters for steam or other fluids, in which a paddlewheel is rotated by the impact of steam or other fluid, and the number of its rotations counted and recorded by a counting and recording mechanism similar to the mechanism in gas meters, the steam or other fluid being guided to the paddle-wheel by a self-adjusting guide and the movement or rotation of the paddle-wheel regulated or controlled by the application of a hydraulic brake, as hereinafter described."

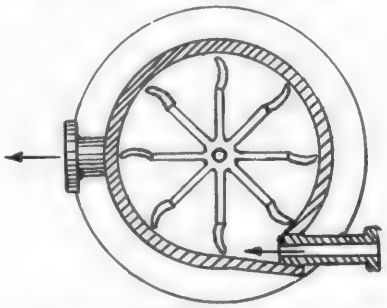


FIG. 2.—CONSTRUCTION OF THE HOLLY METER.

After the appearance of the Holly meter (Figs. 1 and 2) a large number of which were manufactured and used with varying success by a few companies, it seems that no great amount of attention was devoted to the improvement of such devices for a period of more than a decade. During this interval the industry encountered a lull in activity as far as metering is concerned, those stations

which were then installed being forced through lack of a really dependable meter to adopt various methods of flat rate charging.

DEVELOPMENT OF CONDENSATION METER.

With the appearance of the condensation meter, in 1904, a renewed impetus was imparted to the scientific development of commercial heating. It is probably on account of inability to obtain a satisfactory steam meter at this period that heating companies were led to adopt the natural substitute—measurement of condensation, which system now enjoys a greater measure of popularity than ever before, notwithstanding the substantial progress which has been made in the design of flow meters.

Many efforts to design steam meters have ended in failure because frequently it was not recognized that meter design depends upon a very exact knowledge of the natural laws governing the flow of fluids; and even to-day inventors sometimes attempt to construct meters that ignore certain of these facts. Many of the faults which appeared in the first designs have been slowly eliminated by a process of experimentation until there are now on the market a few steam meters which may be considered dependable for commercial use.

THREE METHODS OF MEASURING A CENTRAL STATION'S OUTPUT.

There are three methods of measuring the output of a central steam station, and these are:

1. Water meters, which register the amount of water fed into the boilers.
2. Steam meters, which register the amount of steam delivered from the boilers.
3. Condensation meters, which register the amount of return water of condensation from the various customers.

Water meters are desirable for ascertaining records of station output, and for determining various factors, such as evaporation, efficiency, rate of steaming, etc., and, therefore, some form of them should be found in every first-class steam generating plant, if not equipped with steam meters. Without their agency the efficiency of the boilers is a matter of guess work, and slipshod methods may be expected to prevail not only in the boiler room, but in other departments, if no interest is taken in maintaining a complete plant record at all times. The meters themselves should be frequently checked for accuracy by accurately weighing the water fed to the boilers. When curve drawing instruments are used they indicate not only the total amount of evaporation but also whether or not the water is fed into the boilers in a steady and economical manner.

DIFFICULTIES IN METERING STEAM.

In view of the apparent success of other forms of meters, gas, water and electricity, it would be expected that man's ingenuity could as easily overcome all obstacles to invention in the field of steam engineering. We find, however, that the quantitative determination of steam flow involves a surprisingly large number of variables, affecting the practical limits of design and accuracy.

Could steam be depended upon to obey the theoretical laws of thermodynamics under all ordinary conditions the solution would be evident; but, unfortunately steam cannot be considered a perfect gas, amenable to such formulas. Only when its temperature is maintained well above the point where any moisture can be present (that is to say superheated) will theory coincide with practice. This is seldom the case for any appreciable length of time, and in commercial work the substance is known to be extremely unstable and elastic in form, its properties subject to continuous alteration.

The various conditions affecting the measurements are: density, pressure, temperature, moisture, and superheat, and while it has been the constant endeavor of inventors to compensate automatically for as many of these variables as possible, yet to-day, there is no steam meter on the market which is automatic, in the strict sense applicable to gas, water and electric meters. By this is meant that all steam meters require the addition of more or less computation for securing exact and therefore dependable results. In a classification of steam meters there are primarily two main types, (*a*) area meters which include only the floating-valve type of meters, and, (*b*) velocity meters which comprise all other meters.

Velocity meters are again divided into shunt types and series type.

THE FUNDAMENTAL LAWS OF DESIGN.

Any attempt to present a discussion of meters would be incomplete without some reference to the mechanical laws of design, or the theoretical phases of the problem. Therefore several formulæ must be given in order to gain an accurate knowledge of the fundamentals. An effort will be made to avoid a severe mathematical treatment of the subject and as will be seen only elementary equations, which will be easily understood, will be employed. As the designation implies, area meters are devices designed to determine the flow of fluids by means of a varying cross-section or orifice. The fundamental equation for the flow of any fluid is as follows:

$$W = A \times d \times V \times K \ldots\ldots\ldots (1)$$

in which

W = weight in pounds per second.
A = Area of orifice in square feet.
d = Unit density or weight of the fluid in pounds per cubic foot.
V = Velocity in feet per second.
K = Co-efficient determined by experiment.

Upon this formula is based the design of all types of water and steam meters, including both area and velocity types.

When certain known values are assigned to the various factors, in equation (1) a solution is possible. Suppose, for simplicity of explanation, that the values d and K be considered unity in all cases. We thus have:

$$W = A \times V \ldots\ldots\ldots\ldots\ldots (2)$$

To solve this equation some one of the variables must be constant and another determinable for a certain condition. If, for example, the velocity "V" is assumed to have a constant or fixed value, it will be seen that the value of "W" varies as the area "A" or, conversely, for different quantities of flow the area must increase or decrease if the velocity is to remain the same under all conditions of flow.

Now before progressing further, let us consider a very vital fact, namely, that the flow of a fluid, steam for example, through a pipe or orifice is produced by a drop or lowering in pressure between the inlet and the outlet or discharge. Just as hydraulics teaches that water seeks its level, so equilibrium is established through increased velocity in a pipe line discharging steam.

The drop, therefore, is a function of the velocity; and with a certain definite drop through an orifice of constant cross-section the amount of steam passing through the orifice will vary with the size of the orifice. The recognition of these two relations led to the invention of a type of steam meter which we have just classified as "area meters," but which are also known by various other names, such as: displacement meters, cross-section meters, throttling meters, and valve meters.

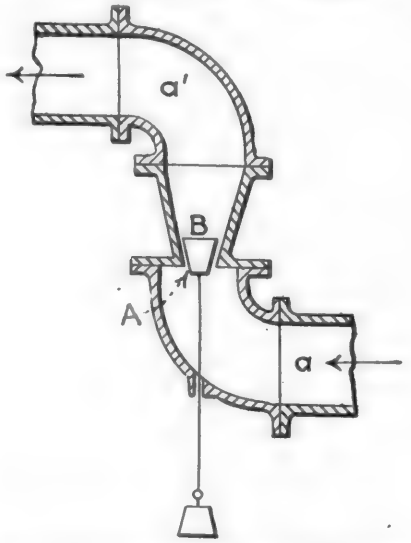



FIG. 3.—DIAGRAM SHOWING BASIS OF DESIGN OF AREA METERS.

The above simple mathematical considerations upon which are based the design of area meters, will be better understood by referring to Fig. 3. This diagram comprises three elements: "A", the restricted orifice, in a pipe line; "B," the movable valve disc; and "C" the balance weight.

Suppose the system to be at rest, *i. e.* no steam flowing. The valve disc "B" would be kept seated tightly by a weight "C." Now, if steam be admitted to "A" its pressure distributed over the lower surface of the valve—will tend to overcome the weight "C" permitting same to rise from the seat. This allows steam to flow through the orifice and enter the chamber (a). Of course, the pressure of the steam will immediately operate here on the upper surface of the valve

and have a tendency to counteract the upward rise of B. The area of these surfaces being equal, it will be understood that the additional force C, downward, will necessitate a greater pressure per square inch at "a" than at "a," if equilibrium is to be established.

According to the Bernouilli theorem, the sum of the pressure head, velocity head and friction head (or loss) must be constant in any two portions of a pipe containing a flowing fluid. If these factors are represented by P, $\frac{V^2}{2g}$ and F, respectively, then

$$P_1 + \frac{V^2}{2g} + F_1 = P_2 + \frac{V_2^2}{2g} + F_2 = K$$

The friction loss through short orifices or pipes may be neglected and therefore we have the purely theoretical assumption:

$$P \text{ (Potential Energy)} + \frac{V^2}{2g} \text{ (Kinetic Energy)} = K$$

from which it follows that the various energies in the fluid per unit of mass, are interchangeable and susceptible of transformation or conversion into other forms, their total remaining a constant.

This is exactly what occurs in the example we are considering. The potential energy (or pressure head) in flowing through the orifice "$P_2$ $a_2$" is reduced below the value "$P_1$ $a_1$," by a certain definite amount depending upon the design of the different component parts, including the weight C. This drop in pressure ($P_1$ $a_1$—$P_2$ $a_2$) is transformed into kinetic energy (or velocity head) and the result is an increase in velocity through the restricted area due to the throttling effect of the valve. Conversely, this throttling energy or pressure drop is utilized in lifting the valve from its seat. The valve is so tapered that the vertical movement of B is directly proportional to the increase in net area and, therefore, to the weight of steam flowing. This movement, when recorded by suitable devices, gives a continuous record of all momentary variations of flow. The theories stated above enable us to deduce a workable formula for area or throttling meters.

For the factor V, Equation (1), we may substitute its equivalent as represented by the well-known form:

$$V = \sqrt{2\,g\,h} \quad \ldots\ldots\ldots\ldots (3)$$

Where V = Velocity in feet per second.
g = Acceleration of gravity = 32.2 ft. per second.
h = Head in feet, of an imaginary column of the fluid, corresponding to the increase in velocity head or which would be supported by its equivalent, the pressure drop.

The value "h" is determined, as we have just seen, by the pressure drop through the orifice, and may be computed as follows:

The pressure per square inch exerted by a column of fluid having a density "d" pounds per cubic foot is equal to (d ÷ 144), therefore, we have:

$$h = (p_1 - p_2) \div \frac{d}{144}$$

where

$P_1$ = Initial pressure — below the valve — pounds per square inch absolute.
$p_2$ = Discharge pressure — above the valve — pounds per square inch absolute.

Therefore equation (3) becomes,

$$V = \sqrt{2g \frac{(p_1 - p_2)}{\frac{d}{144}}} = \sqrt{2g \frac{(p_1 - p_2)\ 144}{d}} \quad \ldots\ldots\ldots (4)$$

Substituting in (1)

$$W = A \times d \times K \times \sqrt{2g \frac{(p_1 - p_2)\ 144}{d}}$$

Clearing this equation we have:—

$$W = A \times K \sqrt{d\,(p_1 - p_2)}.$$

and since $(p_1 - p_2)$ is a constant for any one meter, depending only on the arbitrary weight of the valve the equation may be further simplified by incorporating this value in the constant K. Accordingly,

$$W = A \times K \sqrt{d} \quad \ldots\ldots\ldots\ldots (5)$$

This formula represents the theoretical action of area meters and has been found

to be in remarkable agreement with actual test results throughout practically the entire range of pressures for which the meter is designed. Thus, if we know the characteristics of each meter as it leaves the manufacturer:—viz., the drop in pressure $(p_1 - p_2)$ and the net area of the orifice for certain rises of the valve, the performance of the meter may be very closely approximated, by calculation. However, there is no necessity of this in practice, since each meter is calibrated before leaving the factory, by passing

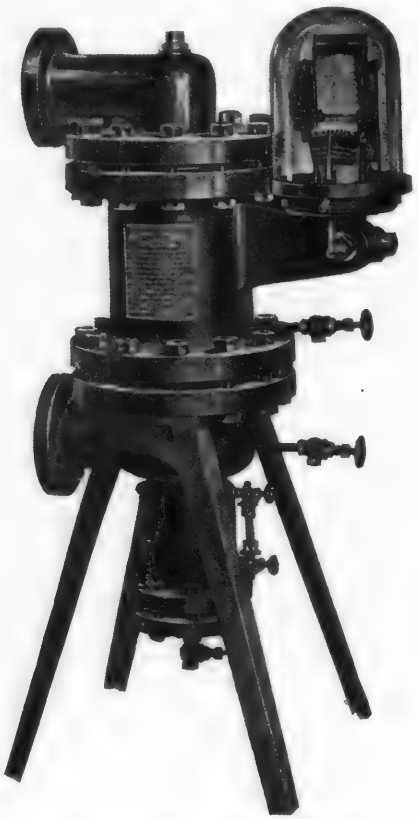


FIG. 4.—ST. JOHN METER.

steam through it and thence into a surface condenser, enabling measurement of the condensed steam to be made on suitable platform scales.

An empirical formula extensively employed by engineers for computing the flow of steam, through an orifice is given in Babcock & Wilcox "Steam."

$$W = A \times K \sqrt{p_2 (p_1 - p_2)}$$

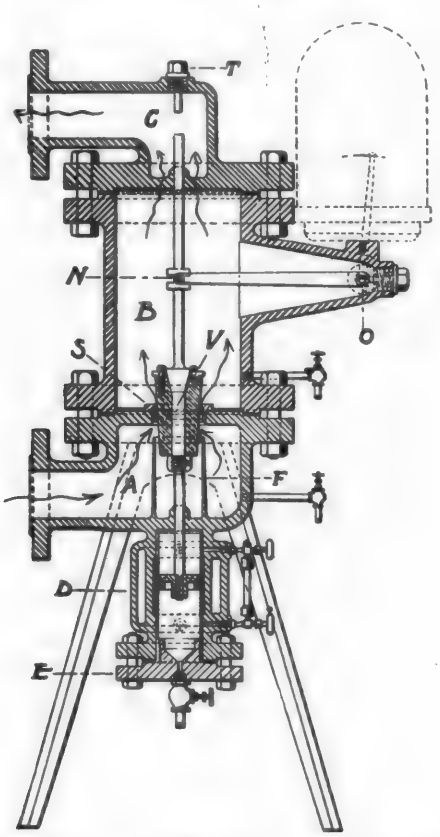
in which the notations are as given in equations (4) and (5). This formula may be reduced to the form

$$W = 1.7 \times A \sqrt{p_2 (p_1 - p_2)} \ldots . (6)$$

and will be found to check favorably with formula (5).

TYPES OF STEAM METERS.

Fig. 4 illustrates the St. John meter, first patented about 1893. This is representative of the area type of meter and has enjoyed perhaps more popularity among steam companies in this country than any other meter of this type.




INTERIOR CONSTRUCTION OF ST. JOHN METER.

Most engineers are familiar with the action of the pressure reducing valve in which the steam flowing in a pipe line is throttled or wire drawn through an opening or orifice which is smaller than the size of the inlet pipe. The steam after passing through this restricted orifice expands to a lower pressure on the outlet side of the valve. This throttling action is controlled by means of a diaphragm with adjustable tension spring or weighted lever arm so as to maintain any desired throttling effect on the valve and

reduce the discharge pressure to any extent, regardless of the initial pressure. This produces the "drop in pressure" referred to above. Equation (3).

Generally speaking, the action of the St. John meter and other meters of this type may be compared with that of the reducing valve just described. The meter is so constructed that the function of the springs and diaphragm is taken care of by the tapered valve or plug which is mounted on a vertical guide shaft, free to move in a vertical direction in proper openings; and so proportioned and of such weight that, with a constant throttling effect or pressure drop of about 2 lbs. per square inch through the valve seat (which in this case is called the orifice) the valve or plug will be caused to float freely in the path of the flowing steam, its height from the valve seat being proportional to the quantity of steam flowing at any instant. Fig. 5 shows the detailed construction of this meter.

In operation, the meter is inserted at a convenient point in the steam line and the steam enters the lower inlet connection, A, and leaves at the top of the outlet connection, C, which is connected again into the main steam line. When no steam is flowing, the tapered valve or plug, V, will seat itself due to its own weight and remain tightly set against the valve seat, S. While in this position, the yoke, N, and the lever arm, O, will be in their lowest positions; consequently the pencil arm and the dial reading will record zero. When steam is admitted at A, the valve V will tend to rise after the pressure has built up sufficiently to overcome the weight of same.

Because of the tapered form of this valve, as shown in Fig. 5, it is seen that the vertical movement of same will increase the orifice area from zero to the maximum when the valve spindle is raised to the valve stop, T. The rate of increase of area depends solely upon the amount of taper given the valve and it is upon these factors that the quantity of steam is determined.

The weight of the valve (V) together with all its attachments, must be such that it may be exactly balanced and able to float and preserve its equilibrium in the path of the steam when there is exerted a differential pressure of about 2 lbs. per square inch between the inlet and outlet chambers. Thus is established the principle set forth above that if this difference of pressure is at all times maintained, regardless of any position the valve may assume, the quantity of steam will vary as the net area of the orifice. Furthermore, it is evident that the orifice area is proportional to the rise of the valve; consequently this rise is a direct indication of the quantity of steam flowing at any instant. This vertical rise when transferred by means of the lever and pencil arm will trace a line on a paper chart giving a continuous record of the flow of steam during any desired period not to exceed two weeks' duration.

### THEORY OF VELOCITY STEAM METERS.

Referring again to the fundamental equation,

$$W = A \times d \times V \times K \ldots\ldots\ldots (1)$$

We find that a different solution is possible than that arrived at as the basis of area meters; namely, that we may assume a certain orifice or area of constant cross-sectional area "A," and allow the changeable steam flow to be measured in terms of the resultant variation in velocity. This law forms the basis of the so-called velocity meters. The basic principle of velocity meters is, in the last analysis, not essentially at variance with the area meter, since there is involved in either the element of pressure differential. This type, however, embodies the application of the well-known idea of the pressure equivalent of velocity which is familiar to engineers generally, as exemplified by the Pitot tube, Venturi tube, throttling disc and modifications thereof. However, a great many years of experimentation were required before any headway was made in the art of metering steam by variable or natural velocities.

*Next month the authors will discuss the theory of velocity steam meters and will show representative types of these devices. Condensation meters will also be considered.*

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WHILE the determination of what is and what is not good air for breathing purposes has made some headway during the past year, it still remains a fact that so far the results indicated by the investigations are comparatively negligible. For instance, in the experiments conducted by the New York State Commission on Ventilation, the tests were those that were calculated to determine the correctness of modern ventilation theories. There were mental efficiency tests with young men in five varying atmospheric environments ranging from comparatively cool to hot temperatures and with different air supplies, from practically nothing up to 45 cu. ft. per minute per person. The relative humidity was also varied from 50% to 80%. These tests were accompanied by a measurement of the physiological responses and the opinions of the subjects as to their state of comfort was also recorded. The experiment was planned to give information on the subjects' efficiency in a hot, moist room as compared with a cool room; in a room with ample supply of fresh outdoor air as compared with a room in which no air at all was supplied; and a hot, moist room where relief was afforded by the moving air from electric fans.

It is sufficient to say that the only appreciable result on this particular group of subjects was a partial loss of appetite on hot days and on either hot or cool days when the air supply was low. There was, to be sure, a response in the temperature of the body to the temperature changes in the surrounding air, but this was slight (less than 1° C.). There was also less inclination to do work with the higher temperatures, but this statement relates to the amount of work done voluntarily rather than the amount which might be done under necessity.

The commission frankly states that it is difficult at this time to arrive at any sweeping conclusions as to the relative importance of different ventilation factors. It should be noted, however, that a detailed study of the effects of humidity have not been studied at all to date. These will be taken up, however, in the experiments to be made during the coming year in one of New York City's public school buildings, where two classrooms have been equipped so that any desired variation of air movement and humidity may be secured.

Regarding stagnant air, lacking a definite disagreeable odor, but containing all the products of the exhaled breath, including carbon dioxide in excess of 30 parts per 10,000, so far it has only been found to be objectionable "in a manner as yet unknown, but demonstrated by a lessened desire for food," and otherwise showing no debilitating effect on the mental processes or on the various physiological reactions which have been studied in these experiments.

# AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

## Twenty-First Annual Meeting, January 20-22, 1915

With a number and variety of papers that surpassed those presented at any previous gathering, the twenty-first annual meeting of The American Society of Heating and Ventilating Engineers, held January 20-22, 1915, at the Engineering Societies Building, New York, will take rank as one of the most interesting and probably the best-attended in its history.

Without doubt, the most important single achievement at the meeting was the formulation of a set of definite requirements for a compulsory ventilation law. This was put forth in place of a model law, which it was found impossible to draft to meet all conditions.

The suggested requirements, therefore, were made up instead, separate sets of requirements being included to cover different classes of buildings. As soon as these requirements have received the finishing touches of the council of the society, they will be placed in the hands of all the boards of health in the country as well as being given general publicity.

Emphasis was laid on the fact that they are not intended to be the last word on the subject, but are something definite that can be used until further progress in the art brings to light any changes or additions that are necessary.

DWIGHT D. KIMBALL,
President, American Society of Heating and Ventilating Engineers.

**Afternoon Session, January 20.**

President Samuel R. Lewis opened the meeting by presenting his annual address, which was a discussion of operating costs.

This was followed by the report of the Secretary, J. J. Blackmore, who made the announcement that Volumes 19 and 20, covering the years 1913 and 1914, have now been issued, thus bringing the transactions of the society up to date.

He showed the affairs of the society to be in excellent shape, with sufficient funds on hand to meet all obligations and leave a comfortable balance on hand. The excess of the society's assets over its liabilities was reported to be $9,087.42, giving an average equity per member of $17.92.

The report of Treasurer James A. Donnelly gave details of the receipts and expenditures for the year, the total receipts being $6,362.49, which, added to last year's balance, made a total of $8,932.40. The disbursements for the year were $6,587.66, making the balance $2,344.38.

The council, in its report, spoke of the resignation of Secretary E. A. Scott and the appointment of J. J. Blackmore to be constantly employed in the secretary's office. The council stated that the membership has grown during the year to a

greater extent than ever before and the income has materially increased.

The council expressed its opinion that the prosperity of the society and its influence for good will be greatly enhanced if a permanent secretary can be retained. The council also expressed its belief that the secretary of the society should be conversant with every branch of engineering that relates to heating and ventilation, for often the secretary has to represent the society before engineering schools and societies to secure co-operation in the work of the society.

It was shown that 80 members had been added to the roll during the year, the net increase, after deducting losses, being 45, making the present membership 507.

A number of suggested amendments were presented in the report of the council, which were taken up at a later session.

REPORT OF COMMITTEE ON VENTILATION STANDARDS.

One of the most important matters to be taken up by the meeting was presented at this session, consisting of a 27-page report of the committee appointed January, 1914, to prepare a set of minimum ventilation requirements for public and semi-public buildings which the society can recommend for legislation.

The committee's recommendations, as presented by Frank T. Chapman, were based on volume and $CO_2$ content and embraced sections on "General Suggestions for the Compilation of Laws for Compulsory Ventilation," "Schools and Colleges," "Factories" and "Theaters." These were supplemented by an appendix containing details for fulfilling the requirements which are those used by the Ventilating Division of the Chicago Department of Health.

A lengthy discussion arose over this report, M. W. Franklin making the point that since the physiologists and sanitarians had shown the unimportance of carbon dioxide as an air test, and that the principal causes of so-called bad ventilation were due to excessive heat and humidity, the requirements for ventilation should be based upon regulating the heat and humidity, rather than on supplying definite air volumes.

He said that the air quantities contained in the report were, under the circumstances, purely arbitrary and might or might not be necessary.

Mr. Franklin also deprecated the provision allowing local Boards of Health to vary the requirements.

Other speakers referred to the lack of provision for the cooling of theaters. This, it was pointed out, is often more necessary than their heating or ventilation.

The report was finally disposed of by giving it the approval of the society subject to such modifications as are necessary, these to be made by the new council.

It is hoped that the report will be in final shape for publication by March of this year. When ready it will be sent to every Board of Health throughout the country. The point was emphasized that the report is not intended to be a model compulsory ventilation law, as the committee had found it impractical to attempt to draft a model law with the necessary legal phraseology. The report, therefore, is devoted to general suggestions for minimum heating and ventilation requirements that are applicable to the classes of buildings as given. The full committee was composed of J. D. Hoffman, chairman; E. Vernon Hill and Frank T. Chapman.

The next report was that of the committee on the development of heating and ventilating industrial buildings, E. L. Hogan, chairman. This report recommended that the society take up the matter of standards of heating or methods of determining heat losses. The report was received and referred to the council, with the recommendation that the matter of such standards be taken up by the committee on standards.

A report was then presented by the committee on the best place to locate radiators in rooms, W. F. Verner, chairman. This report was read by Secretary Blackmore and stated that it was hoped to submit in the near future results of tests made by placing radiators in different parts of rooms which will be of different size and shape and with the walls exposed in various ways.

The committee on chimneys and their effect on heating and ventilating apparatus was not yet ready to report.

ANNUAL DINNER OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS AT THE HOTEL McALPIN, NEW YORK, JANUARY 21, 1915.

President Lewis then appointed as tellers of election, F. K. Chew, W. G. R. Braemer and F. K. Davis.

The election of a nominating committee was then taken up and resulted in the election of the following: Frank K. Chew, chairman; Bert C. Davis, William G. Snow, Hugh J. Barron and J. I. Lyle.

WILLIAM J. BALDWIN ELECTED AN HONORARY MEMBER.

While the tellers were counting the ballots President Lewis announced that William J. Baldwin, whom he described as the "dean" of the heating profession, had been passed by the council for honorary membership. On putting the matter to the meeting Mr. Baldwin was elected unanimously.

Mr. Baldwin, who was present, responded gracefully to the society's action and expressed his appreciation of the honor which, he said, he would be very happy to make use of.

CHARTER FOR ST. LOUIS CHAPTER.

President Lewis then announced that the St. Louis members had made application for a charter for a local chapter at that point. Their application, he said, had been passed by the council, and was now up to the meeting. On being put to a vote the application for the charter was granted by unanimous vote.

Under new business, the proposed amendments to the constitution were taken up. The principal amendment proposed was one widening the scope of membership to include "chemists, physicians, health or ventilation inspectors, and scientists." This aroused a lengthy discussion and was eventually voted down.

**Evening Session, January 20.**

At the opening of the evening session the report of the tellers was presented, showing the election of the following:

NEW OFFICERS.

President—Dwight D. Kimball, New York.

First Vice-President—Harry N. Hart, Chicago.

Second Vice-President—Frank T. Chapman, New York.

Treasurer—Homer Addams, New York.

Council—D. D. Kimball, Harry N. Hart, Frank T. Chapman, Homer Addams, Frank Irving Cooper, Boston; E. V. Hill, Chicago; W. M. Kingsbury, Cleveland, O.; Samuel R. Lewis, Chicago; Frank G. McCann, New York; J. T. J. Mellon, Philadelphia; Henry C. Meyer, Jr., New York, and Arthur K. Ohmes, New York.

The first paper of the evening session was one by A. M. Feldman, on "An Experiment with Ozone as an Adjunct to Artificial Ventilation at the Mt. Sinai Hospital, New York City." This paper reported gratifying results secured in this instance through the use of ozone, the writer stating that its use neutralized certain odors generated in the room in which it was installed, as attested to by the nurse in charge and by the attending and visiting physicians. The results reported by Mr. Feldman were corroborated by M. W. Franklin, who gave details of the experiments conducted by him in which it was demonstrated that ozone definitely destroyed such odors as those emanating from limburger cheese, etc.

The next paper had a special significance to the society in that it was written by the late Frank L. Busey and completed a short time before his death. The paper was based upon a lecture delivered by Mr. Busey before the New York and Illinois Chapters of the Heating Engineers' Society, and was entitled, "The Centrifugal Fan, the Development, Performance and Selection of the Steel Plate and Multivane Types." The paper was read by Willis H. Carrier, a fact which also had a special significance because Mr. Carrier and Mr. Busey were closely associated in much of their experimental work. As its title indicates, the paper showed all of the important types of fans, covering practically the entire history of the art. A section was devoted to a discussion of the relation between static velocity and total pressure, and between static and total efficiency of centrifugal fans. Another portion took up the relative performance of the straight and curved blades and of the steel plate and multivane types of fans. The paper concluded with some practical suggestions on fan selection.

At the conclusion of the reading of the paper a rising vote of thanks was tendered to Mrs. Frank L. Busey for her kindness in sending the paper to the society.

The next paper was one on "Engine

Condensation," by Perry West, with particular reference to heating with the exhaust.

A written discussion of Mr. West's paper was presented by David Moffatt Myers, in which he took issue with Mr. West's figures for heat losses in passing high pressure steam from a boiler through a system of piping and thence through a reciprocating engine. These losses were given by Mr. West as between 15% and 20%, while, according to Mr. Myers the losses would not run over 13% as a maximum. In his reply, Mr. West stated that his figures referred especially to small engines, while those of Mr. Myers referred to very large engines.

Owing to the fact that a paper was on the programme which had a direct bearing on the discussion, it was then presented. This paper was entitled "The Heating Value of Exhaust Steam" and was read by the author, David Moffatt Myers, containing a chart by which it can easily be ascertained, with any type of engine, what the per cent of B. T. U. of initial steam is contained in the exhaust mixture in the form of dry saturated steam.

As a result of the discussion, which finally turned on the comparative heating value of live and exhaust steam, President Lewis appointed a committee consisting of William Kent, Willis H. Carrier and David Moffatt Myers to look into the matter and report to the summer meeting of the society. This committee will look especially into some results reported by Mr. Ripley which showed a percentage of 14% in favor of exhaust steam, in connection with a particular installation he had had under observation.

**Morning Session, January 21.**

The Thursday morning session was opened with a voluminous report by D. D. Kimball and George T. Palmer, of the New York State Commission on Ventilation, giving the results of physiological and psychological observations during the first year's experiments. While no especially important results have been obtained so far, the series of appetite experiments were considered, the most noteworthy in that the appetites of subjects decreased with an increase in temperature. In these tests the two temperatures used were 68° F. and 86° F. The tests were fairly consistent in showing a better appetite at the lower temperature.

In commenting on the report, Prof. C.-E. A. Winslow, the chairman of the commission, took occasion to disavow the newspaper reports, which credited him with the opinion that stagnant air, if in a cool condition, was suitable for breathing, and practically as good as fresh air.

Prof. Winslow said that even if no ill effects could be traceable directly to stagnant air, the fact remains that such air is objectionable on grounds of decency alone, just as the lack of bathing is not to be tolerated.

J. H. Davis, of Chicago, expressed his pleasure at hearing Prof. Winslow's disclaimer of the stand attributed to him, as he said the alleged statements had been widely circulated and had had the effect in Chicago of making it appear that the attitudes of the New York and Chicago ventilation commissions were at variance, whereas Prof. Winslow now showed that this was not the case.

President Lewis also spoke of the erroneous reports regarding Prof. Winslow's opinions and urged that as wide publicity as possible be given to his actual remarks.

In the course of the discussion Mr. Kimball extended an invitation to the members to visit the laboratories of the New York Ventilation Commission. A motion was passed designating the following day for the trip and arrangements were made for the members to make the trip in a body, going both to the City College and to Public School No. 51, where two specially-constructed rooms will be used for experimental purposes.

Reginald Pelham Bolton then read a paper on the "Problem of City Dust," in which he reviewed the analysis of A. A. Cary of the composition of solid materials emitted with furnace gases or smoke, showing the very considerable quantities of such materials emitted. He also showed that bacteria are vastly more numerous in the air of cities than in the atmosphere of the open country, and quoted the results secured by Dr. George A. Soper in his tests of air in the New York Subway, showing the excessive quantities of bacteria in the subway air. His conclusion emphasized the need of cleaning the air in ventilating systems, as well

as the inadequacy of open window and so-called fresh air methods of ventilation.

The next two papers were on the same general topic and were presented together. There were on "Cinder Removal from the Flue Gases of Power Plants," presented by the author, C. B. Grady, and on "Studies in Air Cleanliness, by Profs. G. C. and M. C. Whipple, read by Secretary Blackmore.

Mr. Grady's paper showed the methods used at the Waterside Station No. 2 of the New York Edison Company for disposing of the cinders which were a cause of annoyance to those in the neighborhood. Results of tests were included, giving the extent of cinder removal amounting to 95% and other interesting points in connection with the movement of the stack gases.

Messrs. Whipple's paper was devoted largely to a series of experiments made in Cambridge, Mass., during the past year for the purpose of determining the distribution of atmospheric dust in different parts of the city. It was shown that the industrial communities of a city contain a greater amount of precipitated impurities than in better cared for districts. It was also shown that the nature and volume of the traffic on streets influences the cleanliness of the air above them.

The samples were taken at a level of 25 ft. above the street and, from comments made in the ensuing discussion, the paper was considered chiefly valuable as giving a method for making such studies.

Mr. Bolton, who discussed the paper, called attention to the fact that in both the old and new subways in New York, arrangements are made to take in the air supply through gratings in the sidewalk. This he characterized as reprehensible to a degree and said it was high time that the matter of admitting quantities of harmful dust through the use of such air intakes was given more serious consideration and steps taken to prevent such practices.

In discussing the dry removal of dust and cinders, William J. Baldwin described an apparatus he had designed which he had found effective.

F. K. Davis called attention to the growing presence in the atmosphere of what he termed an oily dust due to the spreading of oil as a dust preventative. He said on that account that the society should be careful not to go on record as stating that oil will effectively lay the dust. Harry N. Hart also called attention to the amounts of rubber dust found in air samples in Chicago, evidently given off by automobile tires.

**Afternoon Session, January 21.**

The first paper Thursday afternoon was presented by Prof. C.-E. A. Winslow on "A Study of Heating and Ventilating Conditions in a Large Office Building." This building has modern heating equipment with a system of temperature control. The results, however, showed it to be overheated most of the time. It was also shown that the air change was inadequate. In general, the investigation disclosed that both the heating and the ventilating systems had been allowed to fall into such disrepair and to become so ill-adjusted to present needs as to fall far short of realizing the purposes for which they were designed.

The discussion which ensued brought out the fact that in many cases the desire of the operating engineers to make a good showing in fuel economy was responsible for the failure to properly operate heating and ventilating systems.

One remedy for this, proposed by President Lewis, was to make the heating of the building, where a fan is installed, dependent upon the operation of the fan.

It was also brought out that the operating engineers are making noteworthy efforts to improve their knowledge, as evidenced by the discussions which take place at the meeting of their various unions. F. K. Davis proposed that they be invited to attend the chapter meetings of the society, in that way bringing the designing and operating engineers into closer touch with each other.

The next paper was by Frederic Bass and was entitled "The Recirculating of Air in a Schoolroom in Minneapolis." In this paper Mr. Bass supplemented the results reported in a previous paper with further tests along the same lines. These experiments consisted principally in supplying air to the pupils through individual air orifices at each desk top. Air was exhausted at the ceiling through fifteen 3-in. orifices, evenly spaced, and recirculated after passing through a Webster air washer which had the effect of cooling the air about 15° F.

The tests did not show any physical or mental deterioration resulting from the use of recirculated air. There were, however, slight odors to be noticed by one entering the room, but these, he said, were not offensive to persons occupying the room continuously, although the air supply was as low as 8.9 cu. ft. per pupil per minute.

The significance of the results were emphasized by the comparison made by Mr. Bass with the results obtained in another school building containing the usual system of plenum fan ventilation.

In the discussion Willis H. Carrier made the point that with the low air supply as given, the figures for the increase in the carbon dioxide content, when the number of pupils was taken into consideration, could not be accepted as correct. It was a physical impossibility, he said, for the carbon dioxide to remain so low without a considerable addition of fresh air, even after allowing for the amount of carbon dioxide taken out by the air washer. This view was also taken by Arthur K. Ohmes in a written discussion of the paper.

This paper was followed by one on "The Ventilation of Sleeping Cars; Comparative Tests of Various Types of Exhaust Ventilators," presented by the author, Thomas R. Crowder, M.D.

Dr. Crowder's paper was along the line of his previous discussion of this subject. (See THE HEATING AND VENTILATING MAGAZINE for May, 1913.) He called attention to the fact that at each breath we take back into the lungs the expired air which is lodged in the nose and larger bronchi—the so-called "dead space" air. This dead space, he said, constitutes about one-third of the volume of a quiet inspiration. He said the normal amount of carbon dioxide in the air actually breathed was about 5%.

Fresh air, he said, must now be looked upon as air that will have the capacity for taking away the excess body heat. This amount, curiously enough, corresponds closely to that long since arrived at as the air supply necessary to maintain the requisite degree of chemical impurity, but on the new basis it must be cooler air or dryer air or air having more motion.

Dr. Crowder then described the system of exhaust ventilation designed by him which makes use of exhaust ventilators applied to the roof of the car. The paper contained numerous charts showing the results of observations in cars of varying types of construction. These included tests made with different types of exhaust ventilators, the results emphasizing the value of exhaust ventilators for cars, and the superiority of the so-called standard ventilator used on the cars of the Pullman Company.

Other speakers called attention to the fact that the principal trouble experienced in sleeping cars was the high temperature and advocated the use of some regulating device or other method to maintain a lower temperature.

F. K. Davis asked if any experiments had been made recently having a bearing on the matter of the toxic poisoning of the air, as brought out by Messrs. Rosenau and Amoss. Dr. Crowder replied that subsequent experiments had negatived these results and added that even if there was such a thing as toxic poisoning, the ability of the body to adjust itself to such conditions, as evidenced by the fact that the inhaled air always contains a portion of that expired, showed that the lungs were already constantly being filled with such poison.

He said the diminution of one-half of 1% of carbon dioxide on the blood pressure simply resulted in a slower breathing while the addition of a similar amount increased the rate of breathing 100% until the effects of this pressure were overcome. He added that the faculty of the body to take care of such effects was almost incomprehensible.

The next paper of the session was on the "Ventilation of Industrial Plants," by C. T. Graham-Rogers, M.D., director, and William T. Doyle, mechanical engineer, of the Division of Industrial Hygiene of the New York State Department of Labor. This paper was read by Secretary Blackmore.

The paper told of the work done by the division and emphasized the necessity of carrying on a campaign to show the factory owners the value in dollars and cents, through the increased efficiency of the workers, of providing adequate ventilation.

President Lewis said it was quite noticeable in the Middle West that many of the new factory buildings were being

equipped with what corresponded almost to school house types of heating and ventilation systems.

J. H. Davis said that the experience of the American Radiator Company in installing an adequate ventilating plant in one of its new buildings was so satisfactory that the company has now installed elaborate systems of ventilation in all of its plants.

The final paper of the afternoon session was presented by C. A. Fuller and was a report on a "Test of a Cast-Iron Sectional Down-Draft Boiler." The heater tested was a Peerless boiler. In this test no smoke was visible between the firing periods when burning run of mine bituminous coal. The results showed 8.75 lbs. of water evaporated per pound of dry coal, the boiler having a grate surface of 22 sq. ft. and a water heating surface of 210 sq. ft. One of the points noted in the test was the comparatively high efficiency with a high stack temperature. The efficiency of the boiler was shown to be 67.9%.

It was brought out in the discussion that the firing was done every half hour. It was also noted that the figures for grate area should probably be 11 sq. ft., since the lower grate should really be considered as a hearth.

Another point brought out was that with this type of boiler it was good practice to install a boiler from 75% to 100% above the estimated capacity required. This would give better operating conditions in such ways as less frequent firing.

**Afternoon Session, January 22.**

At the opening of the Friday afternoon session, a paper by C. G. Dunnell was read on "Tests of Threading Steel and Wrought Iron Pipe." In the absence of Mr. Dunnell, this paper was presented by Frank N. Speller, metallurgist of the National Tube Company. The paper was illustrated by lantern slides giving an idea of the different types of dies in use and the economy of using a die with the proper pitch, etc. The comparisons showed that considerably more force is required to thread hard steel pipe than is required to thread either wrought iron or soft steel. Comparing iron and steel pipe it was found that the force required to thread is somewhat to the advantage of the iron.

As regards the matter of splitting while being threaded or bent it was found that it took at least 25% more force to twist open the seam in the steel pipe than in the wrought iron.

The next paper was on "Some Phases of Room Heating by Means of Gas Burning Appliances," by George S. Barrows. As stated by the author, this paper was supplementary to the discussion which took place at the 1914 summer meeting of the society. Mr. Barrows is a member of the Committee on Utilization of Gas Appliances of the American Gas Institute. His paper was a broad discussion of the subject and included the topics of central heating, that is, a system to supply several rooms, and individual room heating. Under the latter heading the speaker discussed stationary and portable heaters.

Mr. Barrows strongly emphasized the need of flues to carry away the products of combustion, except when of the smallest size or when installed in well-ventilated rooms. Another function of the flue is to assist in the general ventilation of the room.

The paper contained illustrations of common types of heaters, with a description of each type. These included gas-fired steam radiators.

In discussing the paper one speaker spoke of the high rates made by insurance companies where gas heaters were installed as having an important effect on the cost of operating such systems.

Mr. Barrows said that the gas steam radiator had been approved by the National Underwriters' Laboratory in Chicago and is not regarded as a hazardous risk.

In response to an inquiry Mr. Barrows explained the method of determining the efficiency of the gas radiator as far as the emission of radiant heat was concerned.

The question was asked as to why a gas steam radiator should be used. This was explained by several speakers on the ground that a gas steam radiator will be at a lower temperature than a simple gas radiator, also that the greater surface obtainable with a gas steam radiator permits of utilizing a larger amount of what is distinctly radiating surface.

A paper was then presented by James S. Otis on "Capacity of Steam Pipes at

Different Pressures," in which he presented a number of tables covering pipes of different diameters. As stated by Mr. Otis the feature of the tables was the capacities credited to pipes of the smaller diameters, which were lower than those generally used. These figures, he stated, were found by him to conform more closely to actual practice as well as agreeing with the most recent researches of French, Swedish and German authorities.

Prof. William Kent opened the discussion by stating that the capacities given in the tables correspond closely with those obtained by the Wilcox & Babcock formula, so that on that account their value as something new or different on this subject might be questioned. He also showed that the tables and the formula given in the paper did not correspond so that it remained for the author to present any data he might have so that the tables could be properly checked.

In replying Mr. Otis stated that when the loss of heat from the pipes is considered, as mentioned in the paper, the formula as given will be found to agree with the tables.

Roy E. Lynd then presented a paper on "Rational Methods Applied to the Design of Warm Air Heating Systems." The principal feature of this paper were charts giving practically all the data needed by the designer in proportioning warm air pipes to heat any ordinary room, and giving warm air heater capacities under different conditions of efficiency; also the free air area through the heater under different conditions.

In addition Mr. Lynd gave a specific example showing how the charts would be used in heating a typical house. This was figured for the use of outside air supply, also for furnishing ventilation for six persons and, third, for recirculating air entirely.

Prof. Kent in discussing the paper predicted that the ideal warm air furnace heating system of the future will be one that has an outlet as well as an inlet in each room or apartment. This, he said, would probably take care of the uncertainty of the obstruction factor in the formula for the flow of the warm air.

At this point President Lewis expressed his appreciation of the work done by Secretary J. J. Blackmore and called for a rising vote of thanks to Mr. Blackmore which were given unanimously.

President Lewis then resigned the chair to former President William M. Mackay, who had been delegated to inaugurate the newly-elected officers, which was done with the ladies present. Mr. Mackay, in addressing the meeting, referred to the birth of the society twenty-one years ago and traced its growth and development since then. Hugh J. Barron and B. G. Carpenter were appointed a committee to escort the new officers to the rostrum. Each was separately inducted into office with appropriate remarks by the chairman.

The new president, Dwight D. Kimball, on assuming the chair, pledged his interest to the advancement of the society's objects. He then called on the other officers for remarks, which were made by Vice Presidents Hart and Chapman and Treasurer Addams.

At the conclusion of the installation ceremonies, the meeting adjourned.

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**The Entertainment.**

The total registration of 250 at the meeting of the heating engineers' society included no less than 31 ladies, so that the plans made by the entertainment committee were carried out with much enthusiasm and with notable success. This is especially true of the society dinner which was held Thursday evening, January 21, at the Hotel McAlpin.

On the opening day of the meeting the ladies were entertained at tea at the Colonial Tea Rooms and in the evening, previous to the opening of the evening session, a social reunion was held in the lobby of the Engineering Societies' Building.

On Thursday morning the ladies were taken to the Wanamaker store, where special guides conducted them through the various departments. Here luncheon was served and in the afternoon a Swedish concert was given for them in the auditorium of the store.

The society dinner, on the evening of Thursday, was held in the ballroom of the Hotel McAlpin on the 24th floor. The tables were arranged for dancing between courses. This proved a highly popular innovation and dancing was generally indulged in, both during the dinner and afterwards.

There were but two stated speeches, one by the retiring president, Samuel R. Lewis, who acted as toastmaster, and the other by the new president-elect, Dwight D. Kimball. Mr. Kimball spoke at length upon the work of the society and suggested, among other things, that the society might find it advantageous to

publish a bulletin for the information of its members and such a bulletin could contain the papers to be presented at the society's meetings.

Following the formal addresses, there were impromptu calls for remarks during the lulls between the dances and among those drafted into service were Henry G. Issertell, who gave a humorous account of his running for office in Yonkers last fall; Major J. H. W. Myrick, who addressed the diners on the subject of national preparedness for war; and M. W. Franklin.

On the last day of the meeting the ladies were taken to the Woolworth Tower and in the evening both members and guests went in a party to the Winter Garden to see "Dancing Around."

The entertainment committee, which was appointed from the New York chapter of the society, was made up of George G. Schmidt, chairman; C. E. Scott, C. A. Fuller, Homer Addams, J. I. Lyle, F. G. McCann, Perry West, W. H. Driscoll, W. F. Goodnow, A. S. Armagnac and Conway Kiewitz. Working with the chapter's committee were Secretary J. J. Blackmore and J. A. Donnelly, representing the society.

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**Inspection Trip to Laboratories of New York State Ventilation Commission.**

Acting on an invitation tendered the members of Dwight D. Kimball of the New York State Commission on Ventilation to visit the commission's laboratories at the College of the City of New York, arrangements were made to go to the college in a body Friday morning. Mr. Kimball accompanied the party and on arrival at the college the members were shown the testing room in which studies have been made during the past year with different air conditions and with the subjects engaged in varying degrees of work. The methods and apparatus were explained in detail and an idea given of the further tests that have been planned.

Owing to lack of time it was not possible for the party to visit Public School No. 51, where the commission has fitted up two typical classrooms so that almost any desired air conditions can be obtained, with either upward or downward ventilation. This trip, however, was made the next day, and here the party was shown the equipment and the special apparatus, consisting of duplicate sets of fans and heaters and air washers which will be used for the tests, as well as the numerous air openings through the floors of the classrooms.

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**Illinois Chapter on Kitchen Ventilation.**

"Restaurant and Restaurant Kitchen Ventilation" was the principal topic for discussion at the January meeting of the Illinois Chapter, which met January 11 in the Fraternity Room of the Great Northern Hotel. The meeting followed a chapter dinner and was called to order by President Charles F. Newport.

The topic of the evening was introduced by H. M. Harte. Mr. Harte showed how important the ventilation of hotel kitchens has become, citing the case of the Blackstone Hotel, in Chicago, where an 180-in. fan is kept running 20 hours a day to ventilate the kitchens alone. The La Salle Hotel in Chicago has a 160-in. fan which runs the same number of hours. Mr. Harte told of the present-day practice of building the kitchen exhaust flue like a stack so that, due to the accumulation of grease, it could be burned out periodically. He advocated a two to three-minute air change in restaurant and hotel kitchens.

EQUIPMENT MORE IMPORTANT THAN SIZE OF ROOM IN DETERMINING AIR SUPPLY.

Following Mr. Harte, the chairman introduced J. A. Anderson of the B. F. Sturtevant Company, who said that the important considerations in laying out a kitchen ventilating system was the number of kettles, steam tables, etc., rather than the size of the room. He also advocated a two to three-minute air change.

Another topic discussed at the meeting was "Defective Jobs and Practical Methods of Correcting Their Defects."

Secretary Bronaugh announced the election of the following to membership in the Illinois Chapter: D. I. Cook, J. J. Herlihy, Homer R. Linn, T. H. Monaghan, Alfred E. Stacey, Jr.; Ben Nelson and Richard S. Bull.

Secretary Bronaugh was officially named at the meeting as a delegate to represent the chapter at the annual meeting of the Heating Engineers' Society in New York.

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**Fighting Fire with Electric Fans.**

We have all heard of fighting fire with fire, says *The Architect and Engineer,* but the use of electric fans as an adjunct of the fire department in putting out a blaze is surely novel.

In Boston, not long ago, a fire broke out in the basement of a building occupied by a wholesale paint and chemical concern. The fumes and smoke became so thick that it was impossible for the firemen to enter the basement or direct a stream with any effectiveness, when someone though of electric fans. A half dozen of the ordinary 16-in. size were quickly requisitioned by the fire chief and their breeze directed down the stairway. As soon as the rear basement windows were broken to allow the escape of the smoke and fumes, the effect of the fans gradually cleared the basement so that the firemen could work quickly and effectively in extinguishing the flames.

# LEGAL DECISIONS

### Repairs on Heating Plant—Evidence as to Contract.

In January, 1911, a contract was entered into for the installation of a heating plant in a house, and the work was completed in April following. On January 3, 1912, the tank heater exploded and did certain damage. This was repaired by the contractor who installed the plant, who subsequently brought suit against the owner of the house for the cost of the repairs. The defendant made two claims. One was that the plaintiff furnished the material and labor without any contract and without expectation of pay in repairing damage done by reason of the defective work under the original contract of January, 1911. The other was that his house was injured by the explosion, and that the plaintiff was liable for the damage done, and for this he counterclaimed. That the plaintiff did the repair work was not disputed; the evidence conflicted as to any agreement to pay for it. The trial court substantially instructed the jury that the plaintiff was entitled to recover the amount of his claim, and that the verdict would depend upon the determination of the counterclaim for damages, which, according to the defendant's claim, exceeded in amount the defendant's claim. There was a verdict and judgment for the plaintiff for the full amount of his claim. On appeal this was reversed because, in instructing the jury as it did, the trial court proceeded upon the theory that there was an agreement to pay for the repair work necessarily implied. It disregarded the defendant's claim that the circumstances were such that the jury might infer that the work was done without expectation of pay, and because of a defective performance of the original contract. It was held that it was error to take this contention from the jury, because the jury, if it chose to accept the defendant's version, might conclude that the work done by the plaintiff in the repair of the heating plant was done without expectation of pay; or, in other words, the inference did not follow from the evidence as a matter of law that there was a contract. A "contract implied in fact" requires a meeting of the minds of the parties, an agreement, just as much as an "express contract"; the difference between the two being largely in the character of the evidence by which they are established. The general verdict for the plaintiff for the exact amount of his claim necessarily determined the defendant's counter-claim contrary to his contention. There was, therefore, no new trial of the counter-claim ordered, but only of the plaintiff's cause of action.—Lombard vs. Rahilly, Minnesota Supreme Court, 149 N. W. 950.

### Finding That Heat Regulator Worked Properly.

In an action to recover a balance claimed to be due for the installation of a heating plant in the defendant's building by the plaintiff, the defense was that a regulator connected with the plant failed to properly regulate the heat. It was held that a finding for the plaintiff was sustained by the evidence.—Cahill vs. Dryden, 187 Ill. App. 413.

### Praise for The Heating and Ventilating Magazine's Weather Charts.

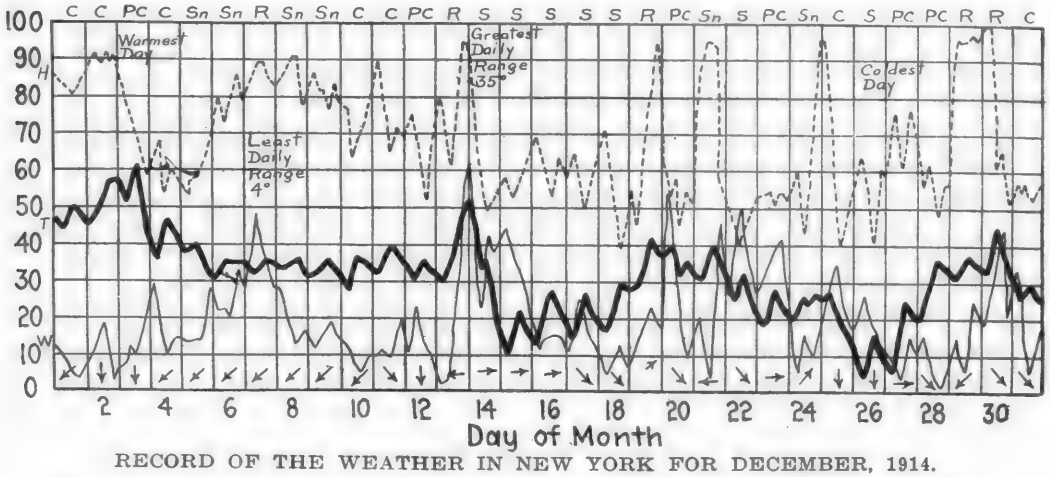
Under the title of "Graphic Methods for Presenting Data," by Willard C. Brinton, which has been running in the *Engineering Magazine*, of New York, the author presents many applications of curves and convenient methods of plotting curves. Among the examples which are shown is a typical weather chart taken from THE HEATING AND VENTILATING MAGAZINE. In speaking of this particular chart, Mr. Brinton says: "A large amount of information has been condensed into a small amount of space, yet the chart is fairly clear and easy of interpretation. Several ingenious combinations have been included, as for instance, the arrows that show the prevailing direction of the wind each day. The chart gives unusually complete information in a most convenient form for any ventilating engineer or power plant manager who wishes to keep careful track of his cost of coal in different months of the year, as dependent upon weather conditions."

### Change in "Daily Consular and Trade Reports."

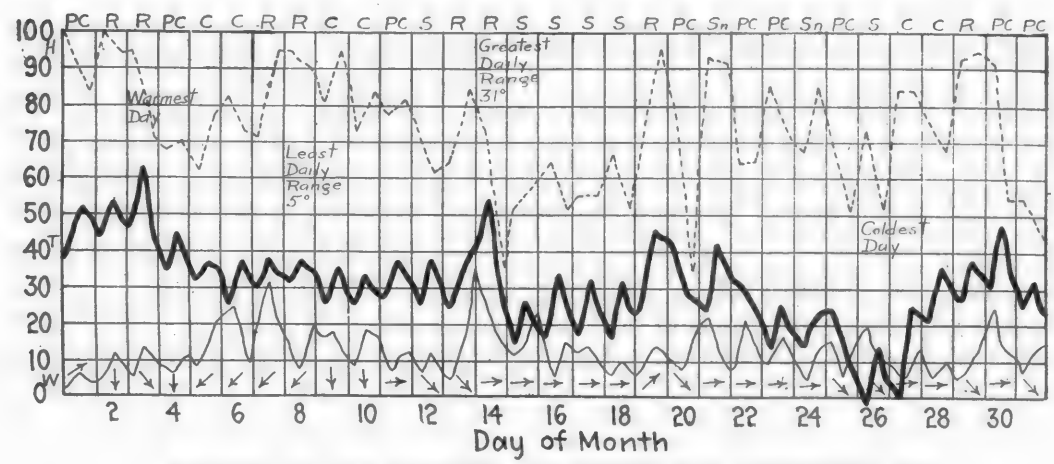
Announcement is made by the Department of Commerce that the name of its daily publication has been changed from "Daily Consular and Trade Reports" to "Commerce Reports." Heretofore this publication has been four days in the making. Henceforth "Commerce Reports" will be turned out at the government printing office within ten hours. Included among the contributors to this publication are 300 American consuls, ten commercial attaches, eight branch offices of the Bureau of Foreign and Domestic Commerce in as many important American cities, and numerous expert commercial agents in all parts of the world. The announcement is signed by Secretary William C. Redfield. "Commerce Reports" will be sent regularly to those requesting it, free of cost.

## The Weather for December, 1914.

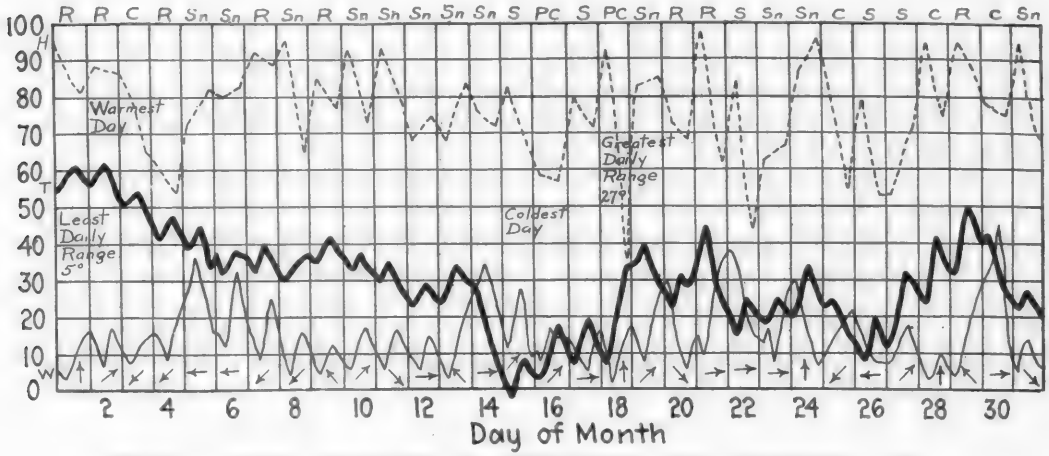
| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, degrees F. | 61 | 62 | 62 | 58 | 60 |
| Date of highest temperature | 3 | 3 | 2 | 1 | 1 |
| Lowest temperature, degrees F | 4 | 2 | 2 | 4 | 2 |
| Date of lowest temperature | 26 | 26 | 15 | 26 | 26 |
| Greatest daily range, degrees F. | 35 | 31 | 27 | 24 | 21 |
| Date of greatest daily range | 14 | 14 | 18 | 30 | 24 |
| Least daily range, degrees F. | 4 | 5 | 5 | 2 | 3 |
| Date of least daily range | 7 | 8 | 1 | 9 | 6 |
| Mean temp. for month, degrees F. | 31.5 | 30 | 30 | 24.1 | 28.6 |
| Normal mean temp. for month, deg. F. | 34.4 | 31.6 | 34.7 | 29.3 | 35.5 |
| Total rainfall, inches | 4 | 3.46 | 4.4 | 2.33 | 2.23 |
| Total snowfall, inches | 2.4 | 4.1 | 15.7 | 8.4 | 2.4 |
| Normal precipitation, this month, inches | 3.45 | 3.41 | 2.73 | 2.07 | 2.23 |
| Total wind movement, miles | 12,511 | 8,575 | 8,808 | 10,253 | 8,619 |
| Average hourly wind velocity, miles | 16.8 | 11.5 | 11.8 | 13.8 | 11.6 |
| Prevailing direction of wind | N.E. | W. | W. | W. | N.W. |
| Number of clear days | 7 | 6 | 5 | 6 | 4 |
| Number of partly cloudy days | 7 | 11 | 3 | 7 | 7 |
| Number of cloudy days | 17 | 14 | 23 | 18 | 20 |
| Number of days on which rain fell | 15 | 10 | 19 | 17 | 17 |
| Number of days on which snow fell | 6 | 2 | 12 | 10 | 4 |
| Snow on ground at end of month | — | 0.2 | 0.1 | 3.7 | — |



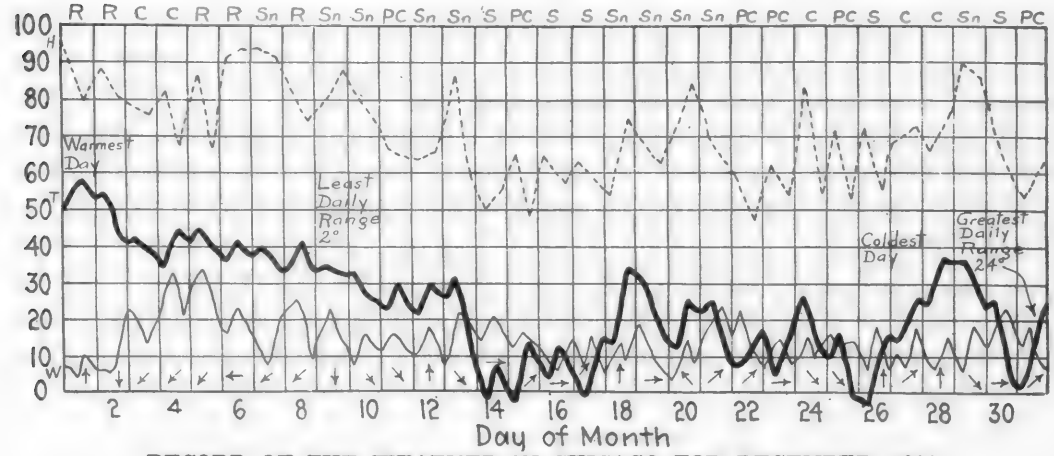

RECORD OF THE WEATHER IN NEW YORK FOR DECEMBER, 1914.



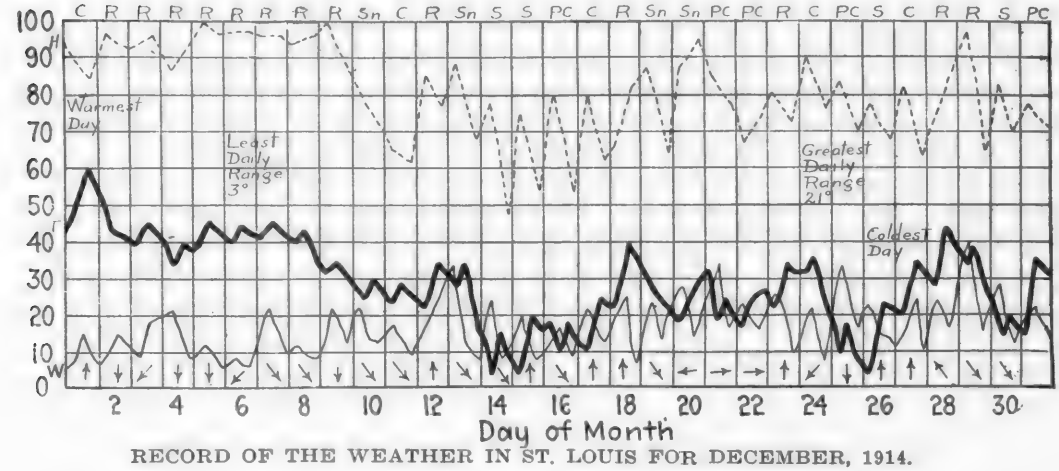

RECORD OF THE WEATHER IN BOSTON FOR DECEMBER, 1914.




RECORD OF THE WEATHER IN PITTSBURGH FOR DECEMBER, 1914.




RECORD OF THE WEATHER IN CHICAGO FOR DECEMBER, 1914.




RECORD OF THE WEATHER IN ST. LOUIS FOR DECEMBER, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

### The European War as a Huge Fresh Air Experiment.

A fresh air talk was recently delivered by Prof. Leonard Hill, of London, in connection with the lecture delivered by Arthur H. Barker before the (British) Institution of Heating and Ventilating Engineers, as reported last month. Among the interesting things said by Prof. Hill on this occasion were the following:

"The first thing one needs to impress upon the people of this country is that the outdoor life is the right life for the human being. He has been evolved to live the outdoor life, and he can stand it as well as the cattle in the field. That the indoor life and the artificial heating of rooms is bad. Admitted that we have to do it because we have to do sedentary work, but sedentary work in heated rooms is essentially bad for the vigor and health of the human being. What it means is that if you keep yourself warm with clothes and with fires instead of living out-of-doors, you give out less calories, which means that you want less food —that you probably eat too much, which leads to bacterial decomposition in the bowels. It means, further, that we do not breathe so deeply as we should, so that part of our lungs are not properly opened, and this enables harmful organisms to enter our lungs. Further, our abdominal organs are not properly massaged. All these things come to pass because of our sedentary work in artificial conditions.

THE WAR: A HUGE EXPERIMENT.

"In this connection, one of the most notable experiments is taking place now owing to the war. Here we have an enormous number of men taken out of town life and put into camp life, living for five or six days in trenches half full of water, and exposed to wind and rain, but through it all well fed and clothed, and what is the result? I was at the War Office the other day looking at the returns and lists of those who were ill, and it was remarkable that there was not a single case of pneumonia or anything of that kind among the Kitchener army, save in one camp which was put in a thoroughly unhealthy place. From other camps there was not a case at all. Phthisis is an indoor disease caused by being shut up in heated and artificially ventilated places. Well, that has got to be worked into the people, and they have got to be made to understand that cold and damp do not cause illness, although they may cause discomfort and local pains by parts of the body getting chilled. Man is an outdoor animal, and he would never have survived the life he has had to live throughout his long evolution had he not the power to do so. We have the case of the curate who was on one of the cruisers which recently was sunk. He dived into the water and was there for two hours, and he is now none the worse for it. There is no evidence that the survivors of the Titanic got colds or pneumonia. These are infectious diseases, caused by our crowding ourselves together."

Dr. Hill, with the aid of diagrams, proceeded to explain the effect of heated air on the mucous membrane of the nose, and said the important factors in ventilation were temperature, humidity and velocity. He was convinced that one of the greatest evils of artificial ventilation was its monotony. The human being has a large area of skin, and was kept alive by the constant stimulation of the vast number of nerve ends in the skin by the varying temperature and the action of the wind. Out of doors there was always air-movement, and the cooling effect was always greater in the country than in the towns. Out of doors, owing to the earth being warm, the cooling effect was least at the ground level, which showed that the Romans, who warmed the floors of their dwellings instead of the air of the rooms, worked on lines nearer to nature than we do today.

### Further Discussion of Standard Boiler Specifications.

A lengthy discussion of the report of the Boiler Specifications Committee of the American Society of Mechanical Engineers, at its annual meeting in December last, brought out the need of further revisions before the standards proposed will become generally acceptable. One of the suggestions made was that the requirements for heating boilers be segregated in a section entirely distinct from the power boiler rules, so that the particular requirements of this class of boilers can be adequately treated. This matter was referred to a representative committee of heating boiler manufacturers for further study. This committee is composed of Richard D. Reed, of the H. B. Smith Co., Westfield, Mass., representing the cast-iron boiler interests; M. S. Moore, of the Kewanee Boiler Co., Kewanee, Ill., representing the steel boiler interests, and Charles E. Gorton, of Gorton & Lidgerwood, 95 Liberty Street, New York.

### Discussion of Radiation Formulas.

In a communication published in the January issue of THE HEATING AND VENTILATING MAGAZINE a comparison was made of different rules recently published in these columns for figuring radiation. It was shown that the results obtained from their use varied considerably. In connection with the formulas an explanation was given of the derivation of one of the formulas and below will be found

an explanation of the other one. In the communication referred to, the writer took a typical room 12x15x9 ft., with 12-in. brick wall, two 3x7 ft. windows with single glass, 12x9 ft. exposed wall with west exposure, having a heated room below and an unheated room above. He figured this out by the two rules referred to and also by the 2-10-200 rule.

In the first case, with the Gifford formula, the result was 77 sq. ft. of radiation. In the second case, with the Wilder formula, the result was 37.62 sq. ft. of radiation; and with the 2-10-200 rule, the result was 59 sq. ft. of radiation required.

In regard to the formula of Byron T. Gifford, Mr. Gifford states:

"I believe the following information will, to a certain extent, clear up the apparent discrepancy in regard to the varying results obtained. In the calculations referred to, which showed 77 sq. ft. of radiation required, it should be remembered that this refers to hot water radiation, while calculations made by the 2-10-200 rule are for low pressure steam heating. Ordinarily, low pressure steam heating will require approximately 60% as much radiation as gravity hot water heating. The constants used in my formula are for central station hot water heating and, in this case, low pressure steam would require about 70% of the amount of central station hot water heating. Seventy per cent of 77 sq. ft. of radiation is approximately 53.9 sq. ft. of radiation, which checks very closely with the results obtained with the 2-10-200 rule, without the additions for west exposure.

"Under the rules and factors which I outlined and which were published in THE HEATING AND VENTILATING MAGAZINE for November, 1914, I have considered the average exposure in the factors. This is due to the fact that the table was made up for central station hot water heating in Indianapolis, which is a rather flat city, and where the exposures are not exceptionally severe; also the fact was taken into consideration that the hot water plant in Indianapolis serves only the residence section.

"Your correspondent mentions his table as the 2-10-200 rule. As I have always understood this rule, it was known as the 2-20-200 rule. If that were the case, the radiation required for the room under his rule would be 12.3 sq. ft. less, or 46 sq. ft. of radiation. In the case of the calculations by the Wilder formula, if the additional radiation for exposure had been taken into consideration, I believe that the required radiation would be 10% more than that obtained, or 41.3 sq. ft.

The reason that the results by my formula do not check with the 2-10-200 results is that my formula is for hot water and the other is for steam. The reason that the results by the Wilder formula do not check with the 2-10-200 results is that the latter considers an exposure and is a thumb rule, which I would not consider accurate. The Wilder formula is based on the heat loss of the room and is more scientific and subject to better analysis than the 2-10 200 rule."

## Inexact Statements in Manufacturers' Catalogues.

In these days it is becoming more than ever important that any appeal to an engineer regarding the merits of a manufactured product must be based on exact statements of fact. In the long run, half truths and distorted statements which may be accepted as fact for a time eventually reflect on the man who makes them and, if made by a responsible house, tend to lower the dignity of the whole engineering profession.

Our readers will no doubt recall many instances of this kind where the misstatements have been so glaring as to raise serious doubts of the good faith of the manufacturer. Of course, the apparatus or appliance itself, whatever its intrinsic merits, must suffer in the process. Very often the misstatements are merely inadvertent.

A typical instance of at least inexact statements is found in a recent circular detailing the merits of a return valve for steam heating. In discussing general physical laws the writer says in one place:

"One cubic foot of steam at 1 lb. pressure maintains a temperature 140° above the room temperature and condenses to 1/30 of one pint of water without change of temperature in radiating the amount of heat."

This is really a meaningless and involved way of stating a physical fact which would be true under all conditions and which does not affect the operation of the article advertised or of any similar article. The statement means that one cubic foot of steam at 1 lb. pressure has a volume of 1/1600 cu. ft. when condensed to water and at a temperature of 213° F. Also, that in condensing to water at the same temperature only the latent heat of evaporation is dissipated, or 970 B. T. U. per pound.

ACTUAL AMOUNT OF HEAT GIVEN OFF BY STEAM AT 1 LB. PRESSURE.

It would have been well to give the actual amount of heat that this cubic foot of steam would give off and then the reader could judge how short a time or how small a room this heat would maintain at any given temperature. It actually gives off 970 B. T. U. ×0.03806=37 B. T. U. which means either a very small room or a very short time, about one second, for 1 sq. ft. of heating surface.

The writer was using intensities to convey the idea of quantity. We might have 100 lbs. pressure on a hermetically sealed tea kettle without accomplishing any work at all, or 2 lbs. pressure on a boiler utilizing 10 tons of fuel a day. The temperature pressure or intensity does not signify quantity but simply indicates a possible rate of doing work.

Another statement made in the same connection is that "this is cheaper and quicker than radiating the same amount of heat by lowering the temperature of the medium and handling many times the volume of return gas or water, as the case may be, when sensible heat is used."

If we assume the same volume of water, or 1 cu. ft. raised 5°, instead of a cubic foot of steam, in the same interval of time it would dissipate 300 B. T. U., instead of 38 B. T. U. as shown for the steam, or eight times as much. So the quoted statement is not correct as far as the supply pipe is concerned. Certainly a supply will have to be provided before the return can be utilized. The statement, as it stands, would tend to disparage the advantages of hot air and hot water heating systems, and yet, if taken literally, the hot air system would be better than a steam system, as it generally requires no return duct system at all.

NOTHING SAID ABOUT SUPPLY PIPES.

Nothing is said about the supply pipes and the statement would emphasize some important disadvantages in this connection. In hot water systems, the same size return is required as for the supply, while with the steam system, the supply is generally larger than for hot water. If the circulation of water is 1 cu. ft. per minute weighing 60 lbs., with a drop in temperature of 15°, the flow of the medium would give 900 B. T. U. per minute.

To get the same flow in the steam supply pipe, which is the comparison drawn in the statement, a pipe capacity of 900÷38=24 cu. ft., or 24 times the area, at the same velocity, would be required.

This, on the other hand, is not a fair statement as concerns the steam, as no account is taken of the less density of the medium. There is not a great difference in the heat conveying capacities of steam and water supply pipes in heating. The less density of the steam is made up by the greater latent heat of condensation and, except in the case of high pressures, the water has the best of it as regards the supply pipe. This, it will be seen, is contrary to the meaning conveyed by the quoted statement.

If 5 ft. per second were taken for the velocity of the water, which is high, and 1 cu. ft. per second discharged with 15° drop, the capacity would be 900 B. T. U. per second. If 75 ft. per second were taken for the steam, which is low, a supply pipe to deliver the same heat capacity would require (24×5)÷75 or 1.6 greater area, which shows the error in the quoted statement.

Again, we read that "the friction in risers and mains due to replacement in the radiators of the steam condensed (when low pressures are maintained and where gravity assists the return water) is small, while in the case of one-pipe or two-pipe systems, the power is two great a proportion of the coal burnt."

TWO CONTRADICTORY STATEMENTS.

Here are two directly contradictory statements as from the nature of the requirements (the use of a return valve) a two-pipe system is a necessity. The size of pipes for the transmission of a given quantity of all fluids, including steam and water, is dependent on the difference in head or pressure which gives the velocity and, of course, the frictional resistance. On low pressure steam, with atmosphere as a limiting pressure, the velocities are low and pipes large, while the power to move is small. In all heating transmission systems, the great loss is by radiation and condensation, due to large diameters and circumferences, even when pipes are covered. The only loss in heat content is by radiation. High velocities give small circumferences and require greater power, but the heat resulting is returned to the medium and is not lost. This holds for both steam and hot water.

The circumference of a steam main 1.6 greater area than the water main would give an exposed surface 25% more for the steam main and, with higher temperatures, would result in a greater loss by radiation with steam, reduced by the amount of the return on the water main over the size of the steam return. In long transmission lines the most economical method of operation is with large drops in pressure, high velocities and small mains. It is possible to reduce the loss so that no condensation will be removed and dry or superheated steam may be obtained at the end of the line. This again does not apply to the particular case in question, but general principles of physics should be used with care when applied in part to the use of particular apparatus.

VOLUME OF STEAM AT DIFFERENT TEMPERATURES.

Another statement is that "the same weight of steam occupies ten times the radiation at 1 lb. as it does at 10 lbs. pressure, while the temperature is only 240° F. as against 212° F. The latent heat is actually 20 units less than at 10 lbs. pressure and the coal burnt is much more."

The volume of steam at 212° is, per pound weight, 26.8 cu. ft. and at 240° F. and corresponding pressure, is 16.32 cu. ft. per pound,

so that the relative spaces occupies are 26.8÷16.32 or 1.66 cu. ft. at 212° to 1 cu. ft. at 240° and not 10 to 1. Also, if the temperature of the surface is 240° F., instead of 212°, and the room is 70°, the heating surface in radiation may be reduced as (240—70)÷(212—70) or 170÷140 or 20% less surface will be required on 240° to do the same work.

Except in extreme cases of high flue temperature the gases seldom require more than 15% of the total heat of the fuel, even when high pressures are carried. Therefore, it is hardly correct to state that a greater amount of fuel would be required to do the same work. Of course, this assumes no waste in either case. Certainly, the same size boiler would do the work in either case if the radiation were reduced in proportion to the difference in temperature corresponding to the pressures and temperatures named.

If the steam actually occupies ten times the space for 1 lb. over 10 lbs. pressure, a supply main ten times the area would be required, if the same velocity were maintained, in either case. It is true that steam at 10 lbs. pressure has a latent heat 20 B. T. U. per pound less than at 1 lb. pressure, but the total heat is greater, as well as the sensible heat. The total heat in steam above 32° F., at 212° and 0 lbs. pressure, including sensible and latent heat, is 1,150.4 B. T. U. per pound, and at 600 lbs. pressure, or the other extreme of the scale, it is only 1,210 B. T. U. per pound, or a difference of 60 B. T. U. The latent heat varies from 970 B. T. U. at 212° to 762 B. T. U. at 600 lbs. and the sensible temperature varies from 212° to 486° F. These physical facts have little or nothing to do with the appliance which the statement referred to, as affecting the advantages of operation.

SIZES OF PIPES AND FITTINGS.

The statement is made that "in two-pipe, low-pressure steam systems, with water only in the returns, smaller piping, fittings and radiators can be used." This is incorrect as with a lower pressure steam larger supply mains are required due to the greater volume as shown by the statement that steam at 1 lb. pressure occupies ten times the volume of the same quantity of steam at 10 lbs. pressure and the writer's comments on same. As the temperature of the steam determines the size of the radiators, larger surfaces would be required, due to the lower temperatures.

There is never any solid water in the returns of a properly-installed steam job, either one or two pipe, as water hammer would result. The actual conditions of the steam is one of quality containing entrained water which may run up to 40 to 50% quality of steam.

At the present time heating apparatus may be made to work economically and satisfactorily with hot air, hot water, high or low pressure steam or any combination, one or two pipe, as desired. The only differentiations for various requirements in practice are along the lines of the relative costs of installation versus those of operation and maintenance, and generally the higher the cost the less the cost of operation and maintenance.

## Testing Radiators in Temperatures Above Zero.

In testing out the heating system of a large railroad terminal, it was found that the radiation in the waiting room was sufficient to heat the room to 70° F. when the outside temperature was 30° F. The system has been guaranteed to heat all rooms to 70°, with an outside temperature of zero, but it would seem from the above-mentioned test that the guarantee cannot be fulfilled. The problem is to find the temperature of this room when the outside temperature is at zero. The waiting room contains 2,200 sq. ft. of direct radiation, of which 800 sq. ft. is wall radiation and 1,400 sq. ft. is contained in five 3-col. radiators 42 in. high.

The current of air around the surface of a radiator increases in temperature as it passes through the columns of the radiator, or as it rises along its sides. The temperature difference between the steam in the radiator and the air is, therefore, reduced. As the transmission of heat units depends upon this difference in temperature, it follows that a single-column low radiator has the greatest efficiency.

With steam at a temperature of 220° F. and the room at 70° F., the temperature difference is 150°, these conditions being accepted as standard. The factor of transmission will vary approximately 2 per cent for each five degrees of variation from the standard; if less, the transmission will be less, and if more, the transmission will be greater.

The conditions as outlined in the preceding paragraphs affect the solution of the problem under consideration. The B.T.U. transmitted per sq. ft. per degree difference in temperature per hour for a temperature difference of 150° F. is 1.9 B.T.U. for wall radiators having vertical loops, and 1.5 B.T.U. for a 3-col. radiator 42 in. high.

Total wall radiator transmission = 800 sq. ft. × 1.9 × 150 = 228,000 B.T.U.

Total circular radiator transmission = 1,400 sq. ft. × 1.5 × 150 = 315,000 B.T.U.

Total transmission, 228,000 + 315,000 = 543,000 B.T.U.

The total transmission from the radiation of 543,000 B.T.U. is lost through exposed surfaces of the building construction and by air change, this being the number of heat units that must be given off to heat the room to 70° F., when the temperature difference between the inside and the outside of the room is 70 – 30 = 40° F.

543,000 B.T.U. ÷ 40 = 13,575 B.T.U. lost through exposed walls and by air change for each degree of temperature difference between the air in the room and that outside.

Let x = temperature of room when the outside temperature is zero.

Then $13{,}575\ x =$

$$[(1.9 \times 0.02 \frac{(220 - x - 150)}{10} + 1.9)\ (220 - x)\ 800] + [(1.5 \times 0.02 \frac{(220 - x\ 150)}{10} + 1.5)\ (220 - x)\ 1400]$$

= heat given off by the total radiation installed per hour when the outside temperature is zero and the temperature of the room is x.

$13{,}575\ x = [(2.166 - 0.0038\,x)\ (176000 - 800\,x)] + [(1.71 - 0.003\,x)\ (308{,}000 - 1400\,x)]$

$13{,}575\,x = [(3.04\,x^2 - 2401.6\,x + 381216)] + [(4.27\,x^2 - 3318\,x + 526680)]$

$13{,}575\,x = 7.24\,x^2 - 5719.6\,x + 907896 - 7.24\,x^2 + 19294.6\,x = 907896.$

Divide each side of the equation by 7.24. Then $-x^2 + 2665\,x = 125400$.

Changing the signs and adding to each side of the equation the square of one-half the number before x makes this a quadratic equation.

$x^2 - 2665\,x + (2665 \div 2)^2 = -12544 + (2665 \div 2)^2$

$x - 1332.5 = \sqrt{-125400 + (2665 \div 2)^2}$

$x - 1332.5 = \pm 1284.5$

$x = 1332.5 - 1284.5.$

$x = 48°$ F., the temperature of the room with an outside temperature of zero.

### The Engineering Foundation.

The inauguration of the Engineering Foundation was effected January 27, at the Engineering Societies Building, New York. The Engineering Foundation is a name given to a fund to be administered for the advancement of the arts and sciences connected with engineering and the benefit of mankind. The basis of the fund is a gift of no less than $200,000 donated by Ambrose Swazey, a former president of the American Society of Mechanical Engineers. The participants in the use of the fund will include the United Engineering Societies and also the American Institute of Civil Engineers.

### "Made in the U. S. A." Exposition in New York.

The first national "Made in the U. S. A." industrial exposition will be held in the Grand Central Palace, New York, March 6-13, 1915. The object of the exposition will be to show a comprehensive exhibition of "American made" and "American grown" products. Among the exhibitors will be the United States government, and the Postoffice Department. The City of New York will also have an exhibit.

### An Electric Steam Radiator.

An electric steam radiator, whose cost of operation is no more than that of a gas radiator, has been brought out by the Automatic Electric Heating Co., 2330 Market Street, San Francisco, Cal. It is operated as a vacuum-vapor heater and is made air tight for this purpose. The radiators are portable and are of the standard sizes. They are made either of cast-iron or pressed metal.

To operate the radiator, the socket is fastened to the lamp or wall plug and the current turned on. The radiator is automatically controlled.

### New Publications.

THE ANALYSIS OF COAL WITH PHENOL AS A SOLVENT by S. W. Parr and H. F. Hadley, is a new publication (Bulletin No. 76) of the Engineering Experiment Station of the University of Illinois. The bulletin is illustrated with views of the apparatus used and photographs of the coals taken at different periods of the test. In the summary of results it is stated that:

1. Phenol at 100° C. will dissolve certain constituents of bituminous coals in their natural state. The two subdivisions, designated as *insoluble residue* and *extraction material*, together make substantially 100% or the amount of the original substance.

2. The amount of extractive material is def definite and susceptible of quantitative determination.

3. Studies upon these two type substances indicate that the extract is the vital constituent concerned in the coking of coal. It conforms to the principle already enumerated in that it has a sufficiently definite melting point and a decomposition temperature which is above that of the melting point.

4. Each subdivision is capable of absorbing oxygen. The effect upon the extract is to modify its coking properties by lowering or greatly reducing its power to form a firm and coherent mass.

5. The oxygen taken up in either case is found to be chemically combined. The oxygen taken up by the fresh coal is similarly

held. The insoluble portion has the greater avidity for oxygen. This relation to oxygen has a bearing upon other topics aside from that of coking, as the heating of coal in storage, spontaneous combustion, weathering, and deterioration.

TESTS ON HEATING AND VENTILATING, made under the directions of Dr. K. Brabbée at the Imperial Technical High School at Berlin are described in pamphlets recently published by our Germany contemporary, *Gesundheits-Ingenieur* (R. Oldenburg), Berlin. These pamphlets show the knowledge our German colleagues have of the science of the profession, and the thorough manner and detail with which research work is carried on. Unfortunately the pamphlets received describe mostly tests made on apparatus not used in this country. Nevertheless, the description of, the method of performing and the results of the tests are interesting.

Pamphlet No. 4 describes tests made on a so-called Schlotter fan of the disc type by Dr. K. Brabbée and Dr. M. Kloss, professors at the Berlin Technical High School. This is a type of an having stationary guide vanes on the pressure side.

Pamphlet No. 5 describes a series of tests made by Franz Werner on certain types of steam radiators used in modulating systems. The modulating effect is produced by the mixture of steam and air as in the types of radiators used in the systems of Käferle and Körting. The distribution of the temperature, both for the surface and the interior, was first determined for each section of an ordinary radiator. Tests were made under different steam pressures, and for both top and bottom steam supply connections. Curves are plotted showing the temperature for the various points measured in each section under various working conditions. Similar observations were made on a patented radiator, also on the type of radiators used in the Käferle and Körting systems. Tests were also made on the transmission coefficient and on the pressure loss.

Pamphlet No. 6 describes tests made on safety devices for hot water heating boilers. Observations were first made to determine the size of expansion pipes required for different sizes of heating systems. From a short pipe connected to the outlet of a Strebel hot water boiler, three expansion lines were run, and on these the tests were made. These pipes were of 25, 34 and 39 mm. diameter (approx. 1 in., 1¼ in. and 1½ in.) and ran up in a vertical distance for about 80 ft. At a height of 40 ft. tees and branch pieces were inserted and also in each line was connected, in series, a coil. Valves were placed in the different branches so that tests could be made with either of the three pipes, each of the two different heights, and with or without the coils, as desired. Pressure readings were taken for the different cases, and for various boiler sizes. From the observed pressure readings and corresponding load on boiler, curves were plotted for the different conditions. From these curves and for the worst condition, the following table was made. The table is copied, the nearest equivalent in the English system being added.

| *Sq. ft. of Radiation | Fire Surface of Boiler sq. ft. | Fire Surface in Boiler sq. m. | Dia. of Pipe mm. | Nearest of Pipe in inches |
|---|---|---|---|---|
| Up to 870 | Up to 43 | Up to 4 | 25 | 1 |
| Over 870 to 2160 | Over 43 to 108 | Over 4 to 10 | 34 | 1¼ |
| 2160 to 3220 | Over 108 to 161 | 10 to 15 | 39 | 1½ |
| 3220 to 6020 | 161 to 301 | 15 to 28 | 49 | 2 |
| 6020 to 9046 | 301 to 452 | 28 to 42 | 57 | 2½ |
| 9040 to 13000 | 452 to 646 | 42 to 60 | 64 | 2½ |

(*As it is not customary in the United States to rate heating boilers in heat units and fire surface a column is added giving the ratings in square feet of radiation. The rate of transmission varies according to the disposition of the fire surface, and it may be anything from 2,500 to 5,000 B. T. U. per square feet. A good average for the majority of boilers would be about 3,000 and this figure was used, which divided by 150 gave the rating in square feet of radiation. The smallest size given —25 mm.—is slightly less than 1 in. It is the practice in this country to use ¾ in. for small work.)

The above were supplemented by test made on a type of two-way valve used on hot water systems as a safety device. The method of testing is described and a series of curves are plotted. The size of valve to be used for different sizes of heating systems is also given.

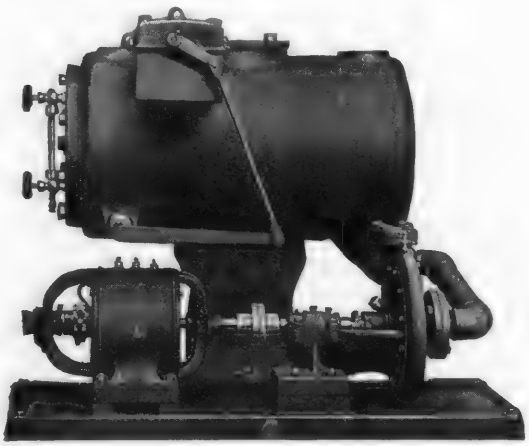
SCIENTIFIC MANAGEMENT, a collection of the more significant articles describing the Taylor system of management, has been published as Volume 1 of Harvard Business Studies. It was edited by Clarence Bertrand Thompson, LL., B., A.M., lecturer on manufacturing in Harvard University. 8vo. Cloth. 878 pages, with diagrams and illustrations. Price, $4.00, and may be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

VENTILATION OF FARM BUILDINGS is the title of a recent bulletin prepared by J. H. Grisdale, B. Agr., Director of Dominion Experimental Farms, and E. S. Archbald, B. A., B. S. A., Dominion Animal Husbandman. It is issued as Bulletion No. 78 of the regular series of the Experimental Farm Bulletins, published by the Dominion's Department of Agriculture, Ottawa. The bulletin includes an illustrated description of the Rutherford system of ventilation.

# NEW DEVICES

### Beach-Russ Automatic Condensation Pump and Receiver.

An interesting type of automatic condensation pump and receiver has recently been placed upon the market by the Beach-Russ Co., 220 Broadway, New York. This apparatus is especially designed to remove the condensation from steam heating systems, dry kilns, etc., and to automatically return the water to low pressure boilers. The pump has its suction connected to the receiver direct, into which the condensation from the heating systems flows by gravity and the discharge is connected with the boiler. The float within the receiver automatically starts the pump when the receiver becomes full and stops it when the receiver is emptied. The company



BEACH-RUSS AUTOMATICCONDENSATION PUMP AND RECEIVER.

manufactures two lines of these condensation pumps and receivers, one series for boiler pressure running from 5 to 15 lbs. and the other for pressures from 15 to 30 lbs. In each case the capacities range from 16,000 sq. ft. to 100,000 sq. ft. of radiation. The manufacturers emphasize the fact that their standard pumps are fitted with bronze impellers and have bronze shafts.

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### A Steam Generator and Indirect Radiator Combined.

A product that is described as something new and unique has lately been brought out in the shape of a steam generator and indirect radiator combined as one unit. This apparatus is manufactured and sold by the

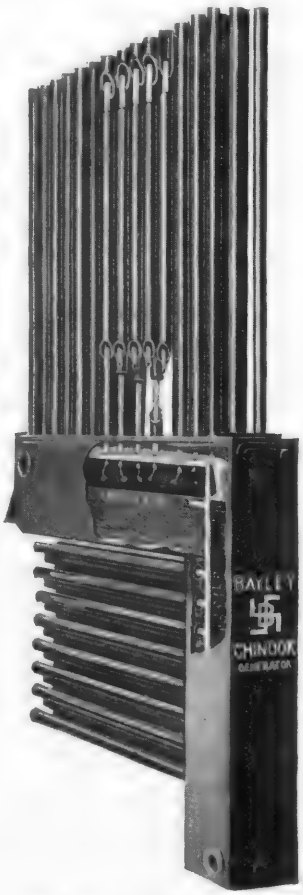



FIG. 1—SECTION OF BAYLEY CHINOOK GENERATOR WITH ONE SECTION OF INDIRECT RADIATOR AS INTEGRAL PART OF GENERATOR.

Bayley Mfg. Co., Milwaukee, Wis., and the accompanying illustrations indicate the principle upon which the generator is built.

Fig. 1 shows one section of the generator with one section of the indirect radiator as an integral part of it. The illustration has been broken away so as to give an interior view showing the water line, steam space, circulating tubes, travel of steam and return of condensation. As steam is raised, it rises directly into the radiator and, when

condensed, falls by gravity into the generator, thus setting up a continuous and unending cycle so long as there is sufficient heat applied to make steam or vapor.

Fig. 2 shows five of these sections grouped and connected, as one unit, by through bolts, fitted with copper gaskets. This illustration is also broken away to show the furnace construction, travel of gases, smoke box extension, etc. The furnace is of the Dutch oven type, made sectional of heavy gray iron castings, lined first with heavy asbestos board and then with fire brick. The arch is of cast-iron in sections, lined with asbestos and fire brick, while the grates are of the rocking and dumping type.

The generator tubes are made of steel, enclosed at the outer end by a plug welded in. The radiator tubes are of the same construction. In both generator and radiator, circulation is obtained through a pipe within a pipe. The outer end of the generator tubes are unsupported and are accessible for cleaning through removable cover plates, as shown. The smoke box extension is of cast-iron, built in sections.

Included in the trimmings are safety valve, damper, regulator, steam gauge, water column and water connection and blow-off openings. With this device there are no steam and drip connections, no return water apparatus and no pipe covering required.

The manufacturers lay emphasis on the point that the Chinook generator, as the apparatus is called, is a safety device, as it is built on the water-tube principle. Also that its compactness permits of its installation where the standard arrangement can not be utilized. It is also stated to be highly efficient; that is, economical in the use of fuel, because of the type of furnace used and because of the fact that there are no radiation losses from steam and drip connections. The water of condensation is returned to the generator at the temperature of the steam. It also does not require a skilled and high-priced attendant, but can be operated by one of average experience.

The Chinook generator was primarily designed to meet the requirements of the small types of buildings, such as schools, churches, theaters, and factories, and for indirect heating only, but it has been found feasible to supply direct radiation as well, in connection with an indirect system, for large buildings.

A blower is used in connection with the generator and a by-pass provided over the indirects. This is to allow cold air, tempered air or hot air to be delivered at will.

With this system it is found that a constant air supply and uniform temperature can be maintained at all times, meeting the requirements of health, as well as those of State laws and city ordinances.

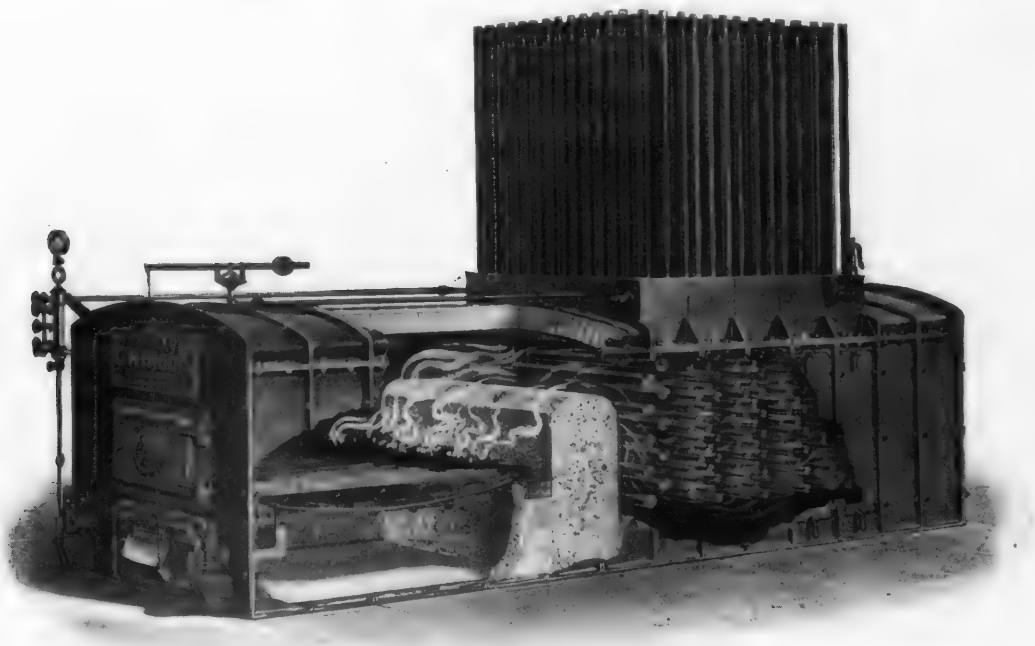
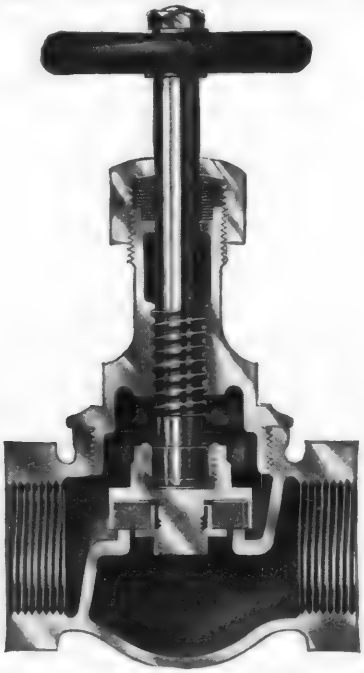


FIG. 2.—FIVE SECTIONS OF BAYLEY CHINOOK GENERATOR GROUPED AND CONNECTED AS ONE UNIT.

### A New Jenkins Bros. Disc.

A new composition disc for steam valves has recently been perfected by Jenkins Bros. in their rubber factory at Elizabeth, N. J., which, it is announced, will be used hereafter in all Jenkins Bros. standard pattern globe, angle, cross and radiator valves. The company states that the fact that it was the first



JENKINS BROS.' VALVE WITH NEW NO. 119 DISC.

in the field with the renewable composition disc has afforded the necessary practical experience so difficult to obtain except through years of experience to improve the disc compound which is now being marketed.

The new disc will be known as the Jenkins Bros. disc No. 119. The composition is notably hard, but is designed to become tough and flexible in service when under steam pressure. It has been shown to have remarkable freedom from cracking and flaking and

THE NEW JENKINS BROS.' DISC NO. 119.

to have the desired durability in working steam pressures up to 150 lbs. During the past year the disc has been undergoing severe tests in hundreds of plants and engineers who are now using the No. 119 disc are quoted as pronouncing it the most satisfactory disc for steam service ever brought to their notice.

The disc is backed by the Jenkins Bros.' guarantee, which has always covered this company's products.

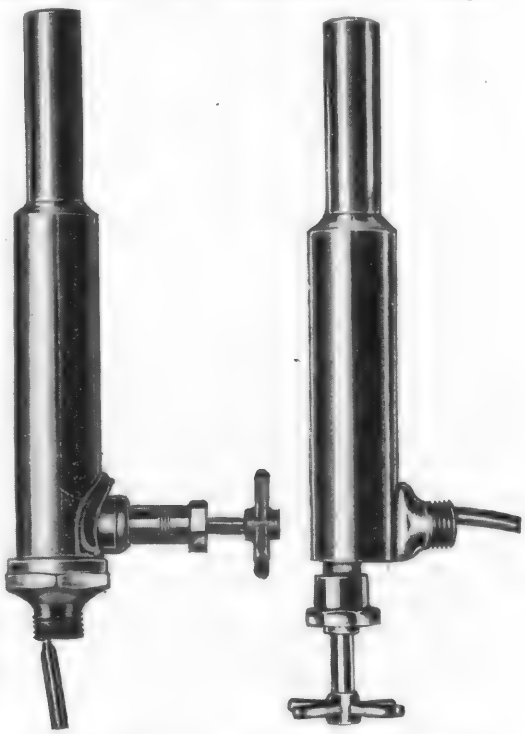
The manufacturers state that a complete service department is maintained to assist those in doubt to procure the proper valve or disc for the proper place. This department is at the disposal of all purchasers of Jenkins Bros.' products without cost. A sample disc may be had free of charge by addressing the manufacturers.

---

### The Steamo Air Moistener.

A humidifying device for supplying the necessary humidity to the air of rooms, including factory and industrial quarters, has lately been placed on the market by the Air Moistener Co., 28 North Market street, Chicago, Ill. This device, as its name implies, operates by admitting steam directly into the air and is notable in that it is noiseless in operation. It is also stated to be automatic so that when once adjusted it requires no attention.

The Steamo air moistener is intended to take the place of the pans and other receptacles of water placed on radiators. Heretofore the use of steam for humidification has not been satisfactory on account of the hissing noise that accompanies its escape



For Attachment to Heating System Independent of Radiator. For Attachment to Steam Radiators.

TYPES OF THE STEAMO AIR MOISTENER.

from the radiator, to say nothing of the dripping of water that required that it be either collected in a pan or else allowed to drop on the floor. The Steamo air moistener embodies a new principle which is intended to overcome these troubles and allow the steam to issue from it silently in a soft cloud, with no dripping of water. It is an attractive-looking nickel-plated instrument, for attachment to the end of the radiator, or to the heating system independent of the radiator and is designed to discharge vapor into the room as long as there is steam in the radiator. The amount of vapor discharged is regulated by a valve at the bottom, or the flow may be shut off entirely, if desired.

This device is made in a number of sizes. Some of them are made for attachment to the steam piping independent of the radiator. These, it is stated, are the styles which eventually will be employed in new work, as it is desirable that the humidification be independent of the heating, so that the temperature will conform to the condition of the moisture. In the use of the larger sizes, such as those for large rooms housing many people, or those that are devoted to some industrial process where humidity is essential, it is noted that the amount of steam discharged is so great that a current of air must be directed across the outlets to absorb the vapor. For this purpose an electric fan is usually used. In a newly-issued catalogue devoted to this device, the manufacturers give a table for calculating the size or number of air moisteners required for any given condition.

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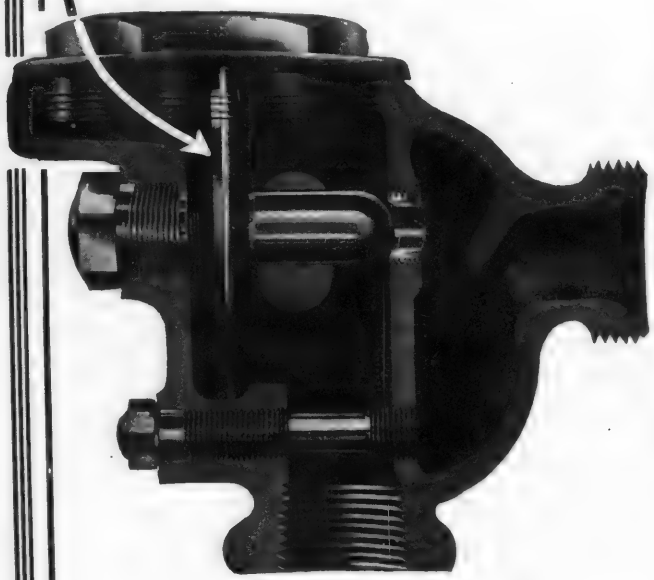

U. S. Patent, April 28, 1914

This valve has a loose thermostat which is not attached to the cover or body of the valve and **requires no adjustment.**

It has a spring bumper to take care of the over-expansion of the thermostat and prevent its collapse or rupture.

**MONASH THERMOSTATIC RETURN LINE VALVE**

*for*

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*Please mention* THE HEATING AND VENTILATING MAGAZINE *when you write.*

# TRADE AND MISCELLANEOUS NOTES

### Coming Events.

**February 17, 1915.**—General meeting of the National Warm Air Heating Association, in Cleveland, O. Headquarters at the Hotel Statler.

**March 17-18, 1915.**—Meeting of the National Association of Brass Manufacturers, in Detroit, Mich.

**June 1-3, 1915.**—Seventh annual convention of the National District Heating Association, in Chicago, Ill. Headquarters at the Hotel Sherman.

**Third Monday in Each Month.**—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, Engineering Societies Building, New York (evening). No meeting in January. Subject for February meeting: "Methods of Measuring Air Velocities and Window Leakage."

**Second Monday in Each Month.**—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening).

**Third Tuesday in Each Month.**—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

### Deaths.

**Frank Leavery,** Syracuse, N. Y., a well-known heating contractor, died December 28, at the Hospital of the Good Shepherd in Syracuse. At the time of his death Mr. Leavery was president of the New York State Association of Master Steam and Hot Water Fitters and also of the local masters' association in Syracuse. He was 46 years old. Mr. Leavery had been identified with the steam fitting business for the past 30 years, his apprenticeship being served in the shop of E. P. Bates, of Syracuse. For the past 12 years he had conducted his own business. He leaves a wife, one son and one daughter.

**Ralph M. Geddes,** president of the Amererican Warming & Ventilating Co., Elmira, N. Y., died at his home in Elmira, January 6. Mr. Geddes was stricken suddenly, the immediate cause of death being a perforation of the larger intestine. It was believed at first that he was suffering from acute indigestion but a diagnosis quickly disclosed the real trouble. An operation was performed in a desperate hope of saving his life but death came shortly after. Mr. Geddes had been prominent in business circles in Elmira for several years and had taken a leading part in many civic and commercial movements in the city.

**Edward Kendall,** Cambridge, Mass., an old-time boiler manufacturer, died at his summer home in Holden, Mass., January 6. He was 93 years old. He was for many years senior member of the firm of Kendall & Roberts, the firm name being changed later to Edward Kendall & Sons. He retired from business in 1905. Two sons survive him.

**James C. Clow,** vice-president of James B. Clow & Sons, Chicago, died at his home in Lake Forest, Ill., December 25. He was 40 years old. Mr. Clow's business career had been entirely with the Clow company. He took considerable interest in the mat-

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**THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.**

ter of accurate cost systems and selling systems for the heating and plumbing trade, much information on this subject being published in the "Clow Bulletin," which he inaugurated.

**John J. Quinlan,** treasurer of the McNab & Harlin Mfg. Co., New York, died at his home in that city December 16. He was 55 years old.

### Miscellaneous Notes.

**Des Moines, Iowa.**—An application for a central heating plant franchise in Des Moines, made by the Continental Gas & Electric Co., of Cleveland, O., has been taken up by the city council and referred to a joint committee of the Chamber of Commerce and the city council. It is expected that the same tests will be applied to the proposal as were applied to the franchise asked for by the Des Moines Electric Company, providing similar privileges. The Chamber of Commerce committee failed to indorse the electric company's franchise following its investigation. The draft of the proposed franchise was submitted by W. H. Abbott, of Abbott & Eaton, consulting engineers for the Continental Gas & Electric Co. This company has large holdings in Iowa and operates public service plants in many parts of the country. It is announced that W. H. Thomson, manager of the Des Moines Electric Company, will oppose the granting of the franchise and will himself seek a central heating plant franchise. If the council acts favorably on the matter of Mr. Abbott's application, the proposition will be submitted to the voters at a special election.

**Cleveland, O.**—Renewal of the agitation to bar lighted cigars, cigarettes and pipes from street cars will be included in the campaign of the Women's Civic Association to obtain better ventilation in the cars of the Cleveland Railway Company, according to Mrs. Anna Herbruck, president of the association. Such an order was promulgated by President John J. Stanley as the result of a crusade two years ago but recently, it is stated, violations have been frequent. Announcement is also made that senior students of the Case School of Applied Science will undertake tests of the air in Cleveland's street cars, such tests to be used in a publicity campaign for the education of the public rather than for use against the railway company. It is planned to lay the results of the tests before the city council with a request that they be referred to the council committee on street railways. This committee, according to the present plan, will confer with the railway company in an effort to find some means of improving the conditions. According


# GREETINGS

**We wish you unbounded happiness and prosperity during the New Year**

More "Reliable" Vacuum Heating Systems were installed last year than during any previous year, and we look for even better business in 1915.

One of the three styles of "Reliable" Heating Systems—the Air Line or Return Line Vacuum or "Vacu-Vapor" System—is particularly suitable for any style or size building from the tallest skyscraper to the bungalow. The "Reliable" is the Universal Line of heating equipment; and the "Reliable" Systems insure most efficient heating results at the minimum fuel cost.

You can save money on the installation if it is a "Reliable" System. You will also be sure of a satisfied customer.

If you have not already installed a "Reliable" System, put in your initial installation soon, and we know you will be so well pleased that you will insist on "Reliable" Systems in the future.

Upon request we will gladly mail you our catalogs and descriptive literature describing any or all of the three "Reliable" Systems.

**THE BISHOP-BABCOCK-BECKER CO.,** GENERAL OFFICES CLEVELAND, O.

to the railway company, before the car ventilators were fastened shut, they were a source of constant trouble. The company compromised with its complaining patrons by fastening open a certain number of the ventilators and permanently closing the others. This, it is claimed, provides for too little ventilation.

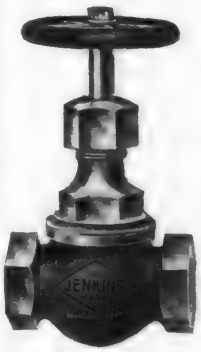
**Indianapolis, Ind.**—The Indiana Federation of Labor has opened its campaign for remedial legislation. These workers will ask the next legislature to favor a constitutional convention, workmen's compensation, shot firers' law, minimum wage law, eight-hour law for women, anti-injunction law, building law and a ventilation law for metal workers.

**Manchester, N. H.**—A $50,000 fire in Manchester December 29 last gutted the quarters of the John H. Stevens Plumbing and Heating Company.

**Chicago, Ill.**—Much interest is being taken in the efforts of the Chicago Department of Health to secure better ventilation for the school buildings in the city. Health Commissioner Young recently applied for six additional inspectors for this work, but the request has been held up by the finance committee of the city council on the ground that the Board of Education does not enforce the ventilation ordinances. It appears that very few inspections of school buildings have been made but in those cases where the ventilation conditions were found to be bad, the board, it is claimed, has taken no steps to remedy the matter. The ventilation division of the board of health, it is pointed out, has only three sanitary inspectors. That means three men to inspect and see that proper ventilation is installed and operated in nearly 5,000 surface and elevated cars, 618 theaters, 330 public schools, 111 private schools and a large number of factories, department stores and public buildings. Two men must work together and can visit two schools a day. At the best it would take 165 days to visit and inspect all the schools.

**New York.**—In an open letter to employers in and about New York, the executive committee of the Mayor's Committee on Unemployment makes the following urgent recommendations: 1. If your product is not subject to seasonal fluctuation or changes in style, manufacture now a reserve stock against a future market; 2. If your output is running below normal, utilize this slack period to overhaul and repair your plant and machinery; 3. If you are unable to give full-time employment to your entire force, employ the fullest possible number for part time, thus distributing the burden; 4. If you contemplate making additions to your plant, do it now.

**National Warm Air Heating Association,** the national organization of warm air furnace manufacturers, will hold a general meeting in Cleveland, O., February 17. Headquarters will be at the Hotel Statler. Among the association's standing committees are those on formula for warm air

The first rule of good valve buying is to have specifications read:

**JENKINS BROS. VALVES**
**WITH THE DIAMOND TRADE MARK**

It pays to be particular in wording the specifications because of the added efficiency obtained in buying the genuine. There are some Jenkins Bros. Valves installed from 25 to 40 years and still in service. All good kinds for all conditions of service. Write for handy catalogue.

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NEW YORK BOSTON PHILADELPHIA CHICAGO MONTREAL LONDON

**SPECIFY FOXBORO THERMOMETERS**
TRADE MARK

**THE LATEST AND BEST BY EVERY TEST** Send for Bulletin No. 73

New York 50 Church St. **The Industrial Instrument Co., Foxboro, Mass.** Chicago Monadnock Bldg.

installations, dealers' costs and manufacturers' costs.

**Chicago, Ill.**—The South Side Heat & Power Company has applied to the city council of Chicago for a franchise to lay steam and hot water pipes in the streets to supply heat and power. The proposed franchise gives the city the right to purchase the plant at any time. The matter has been referred to the joint committee on fire, water, streets and alleys. It is proposed to use the Holly system.

**Master Steam and Hot Water Fitters' Association** of Cleveland, O., at its annual meeting and dinner, December 21, elected the following officers: President, Daniel A. Stewart; vice-president, M. L. Crowell; secretary, W. B. Van Sickle; treasurer, Arthur E. Welker. The executive committee is composed of the four officers and Albin Seidel, of the Becker-Seidel Co.; Walter Klie, of the Smith & Oby Co.; D. C. Smith and William Chafer of the Chafer Co.; and P. J. Chappell, of the Chappell-Warren Co.

**National Association of Brass Manufacturers,** at its annual meeting at the Hotel Biltmore, New York, December 9-10, elected the following officers: President, C. C. Hale, New Haven, Conn.; commissioner, William M. Webster, Chicago; trustees, C. C. Hale, J. M. McDonald, Dubuque, Ia.; A. S. Hills, Haydenville, Mass.; Adolph Mueller, Decatur, Ill.; Theo. Ahrens, Pittsburgh, Pa.; Harold Wolff, Chicago; E. L. Strauss, Cleveland, O. Representatives to the national committee are, for the East, A. C. Cogswell, Detroit, and, for the West, E. F. Niedecken, Milwaukee. The association will hold its spring meeting in Detroit, March 17 and 18.

**Detroit, Mich.**—According to a ruling made by the Department of Education of Detroit, hereafter contractors who make general bids must furnish the names of all sub-contractors who will be connected with the work. This, it is hoped, will serve to prevent abuses in connection with the peddling of sub-contracts.

**Louisville, Ky.**—In an opinion handed down by the State Court of Appeals it is held that the new workmen's compensation law, which was to have gone into effect January 1, 1915, is unconstitutional. While the majority opinion of the court intimates that the legislature could draft a statute on this subject that would be constitutional, the minority opinion states that under the present State constitution and the decision of the majority it would not be possible to pass an effective compensation law.

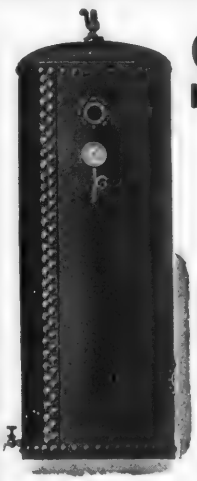
**Hastings, Neb.**—Members of the city council and Mayor Ingraham have declared in favor of a municipal heating plant, as advocated by many leading business men. It is expected that the $19,000 surplus, shown by municipal light, power and water plant during recent months will be used as a starting fund for the proposed heating plant in which will be housed the electric light and power machinery now at the pumping plant.

**New York State Commission on Ventilation** announces the appointment of Robert C. Doremus, of Montclair, as assistant en-

"A Radiator Valve that Can't Leak"

is the title of a booklet that should be in the hands of every person interested in any way in heating systems. It contains complete information about radiator valves in general and Detroit Packless Radiator Valves in particular. Ask for booklet V-46.

DETROIT LUBRICATOR COMPANY
DETROIT, U.S.A.



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Riveted Tanks
Welded Tanks
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Founded 1802- -112 Years Old

Wm. B. Scaife & Sons Co.

NEW YORK OFFICE
26 Cortlandt Street

Pittsburgh, Pa.

**Kingwelton Talks—No. 1**

# There is no Contact of Dirt Deposits and Air in the KINGWELTON ROTARY AIR PURIFIER

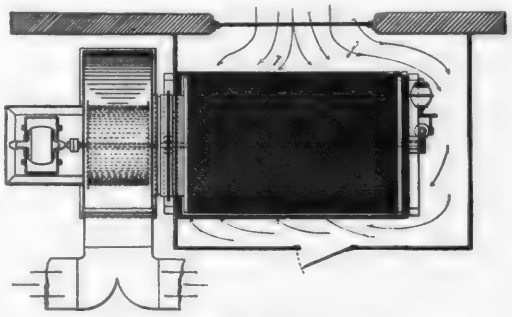
No recirculation of muddy water through the incoming air. The mesh surrounding the drum carries the impurities to the water bath, the washed and purified air being drawn directly from the drum. By the use of this apparatus the air is cleansed of all dirt particles.

A substantial test was made at the Pennsylvania Railroad Station, Pittsburgh, Pa., by the Railroad Company, where the local air is heavily charged with carbon from coal. The Kingwelton Rotary Air Purifier removed 99% of the impurities, depositing the carbon in the bottom of the tank for removal.

This apparatus is manufactured at our own works, in sizes to suit conditions. Plans furnished for ventilating plants, with air purifier combined.

Write for descriptive circular.

**WELLS & NEWTON CO.**
**Avenue B and 17th St., New York**

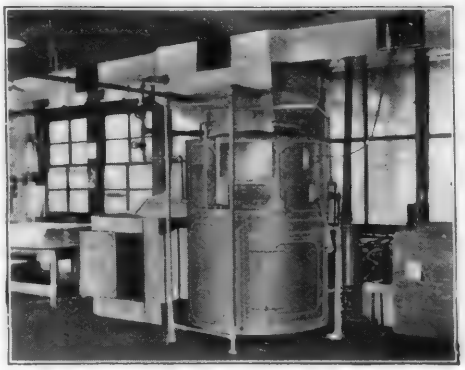


Patented April 13, 1912
**Plan View**

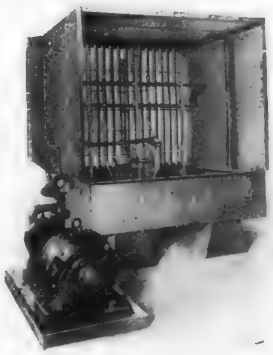
**The "STERLING SYSTEM"**
**Means HIGHEST EFFICIENCY in**

# Air Washing and Cooling

**Automatic Self Flushing Spray Heads (Low Pump H.P.)**
**Vertical Flooded "Scrubbing" Plates.**
**Low Resistance thru Eliminators.**
**Thermo-Humidity Control.**



Type B System (A Complete Ventilating Apparatus)



Type D System

The Spray System is the Heart of the Apparatus. The Sterling Head does not over-humidify during warm weather—therefore no necessity of closing off sprays—results:

**MAXIMUM WORKING EFFICIENCY AT ALL SEASONS**

*To get Highest Efficiency*
*SPECIFY THE ABOVE FEATURES*

Specialists in Air Conditioning and Humidity Control

**BLOMFELDT & RAPP CO., 108-128 Jefferson Street, CHICAGO**

**DISTRICT REPRESENTATIVES:**

**New York City, 801 Longacre Bldg. | St. Paul, Minn., 802 Endicott Bldg.**
**Spokane, Wash., 713 Realty Bldg. | Kansas City, Mo., 1210 Scarritt Bldg.**

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gineer for the commission. Mr. Doremus will take part in the experiments in the research laboratory of the commission at the College of the City of New York.

### Manufacturers' Notes.

**Pierce, Butler & Pierce Mfg. Corporation,** Syracuse, N. Y., announces the appointment of E. F. Glore as manager of its New York branch, succeeding George W. Crane, who has become assistant general sales manager. Mr. Glore was for many years connected with the American Radiator Company, both in the New York and Philadelphia offices, and was more recently with the Richardson & Boynton Co., New York. Five auto trucks have recently been added to the equipment of the New York branch, whose quarters at Fourth avenue and 22nd street contain one of the most attractive displays to be found of heating and plumbing apparatus.

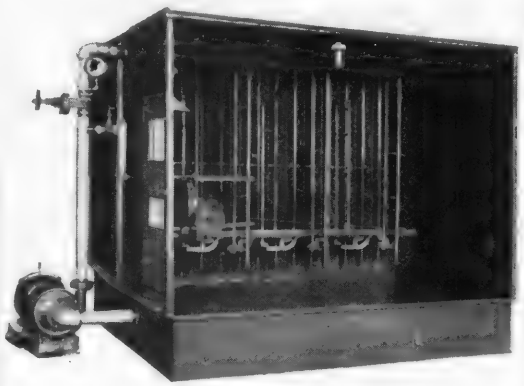
**American Radiator Co.,** Chicago, reports that its domestic business is ahead of a year ago and has been during the past ten months. The company, therefore, expected to show a gain for the fiscal year ending January 31. The manufacturing operations were somewhat curtailed in September and October but with an improvement of conditions the company decided to operate again at full capacity and is doing so now. No definite advices regarding the company's European business have been received and the company has made no estimates regarding it. All the foreign properties are outside of the war zone.

**Bishop-Babcock-Becker Co.,** Cleveland, O., elected the following officers at its recent annual meeting: President, John Sherwin; vice-president, L. A. Becker treasurer, G. E. Collings; secretary and assistant treasurer, E. E. Sargent. The retiring president, J. H. Champ, was elected chairman of the board of directors and L. A. Becker was appointed general sales manager. Mr. Sherwin, the new president of the company, is also president of Cleveland's largest bank.

**Rybolt Heating Co.,** Cincinnati, O., manufacturers of cast-iron hot air furnaces, has acquired a controlling interest in the Ashland Foundry Company, Ashland, O. The capital stock of the Ashland Foundry Company has been increased from $20,000 to $32,000 to take care of proposed additions and improvements to the plant.


## Air Washing and Cooling for THEATRES

Our theatre installations prove the "ACME" way gives desired results for Washing and Cooling.

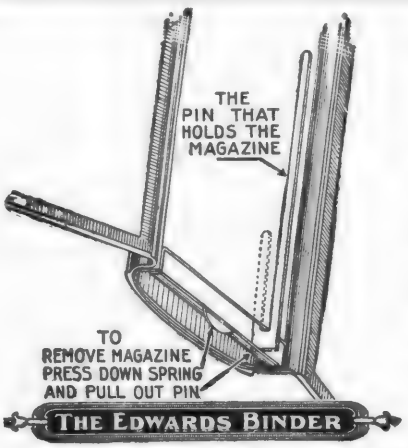


**Iroquois Engineering Co.**

Manufacturers—"ACME" Air Washers,

**CHICAGO, ILL.**

Representatives in all principal cities.

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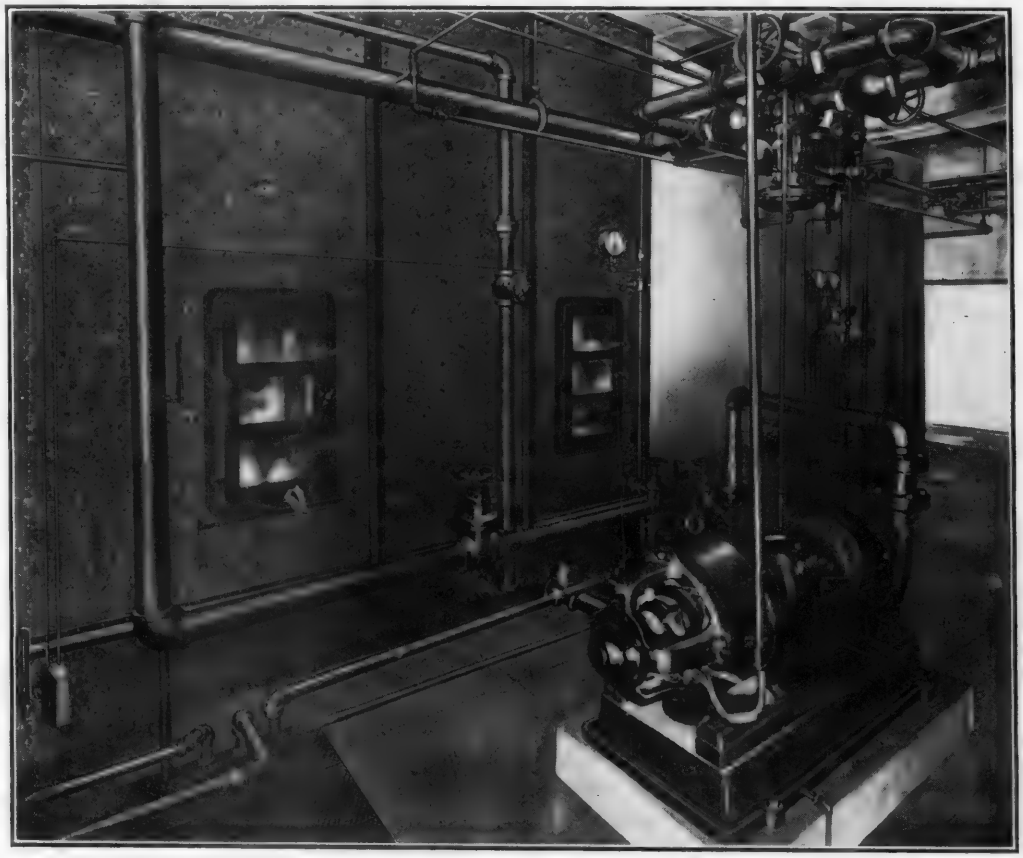


Installation of Webster "Type B" Air Washer Equipped with Humidity Control

# The WEBSTER System of Automatic Humidity Control

**as applied to**

# Webster Air Washers of Various Types

**Perfect in Principle and Accurate in Operation. Practical and Simple**

1. Separate control, by ordinary thermostats, of the average dry and wet-bulb temperatures of air leaving the Air Washer.
2. Independent of unequal air and spray distribution and temperature, ordinarily causing unequal humidification, supersaturation, inaccurate results, etc.
3. Quick response—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.
4. Inherently safe against over humidification.

**Send for catalogue "C"—"88" pages of valuable information**

**Consult us regarding Air Conditioning Apparatus for any purpose.**

**WARREN WEBSTER & CO., CAMDEN, N. J.**

**Established 1888** **24 Branch Offices**

**C. A. Dunham Co.,** Marshalltown, Ia., held the first convention of its sales force at its home office in Marshalltown, January 18-20, when representatives of the company assembled from all parts of the United States and Canada. The first day of the convention was devoted to trips of inspection through the company's plant. This was followed, in the evening, by a theater party. The following two days were devoted to business addresses and discussions, the convention winding up with a banquet on the evening of the 20th.

**H. Mueller Mfg. Co.,** Decatur, Ill., held a successful convention of its salesmen during the week of December 28 to January 2, in which the business of the meetings was interspersed with high jinks that made the occasion one long to be remembered. The culminating event of the convention was the reunion of the '49 club, a quasi-social-fraternal organization. There were three sessions daily, the day sessions being devoted to discussions and instructions in the selling policy of the company. The evening sessions were given over to demonstrations of goods, with lectures by experts from the company's factory. Adolph Mueller, president of the company, was in charge of the meetings. Just before the close of the convention, the salesmen presented the firm with a handsome leather couch for the directors' room. The salesmen were remembered by the firm with substantial presents. A feature of the meeting of the '49 club were the costumes of the diners which were a takeoff on the military costumes of the various nations. Adolph Muller acted as toastmaster for the "Germans" and M. T. Whitney as toastmaster for the "Allies," otherwise the salesmen. George A. Caldwell was elected president of the '49 club for the ensuing year, succeeding J. H. McCormick, whose retirement was made the occasion for the presentation of a gold watch and charm, suitably engraved.

**Clarage Fan Co.,** Kalamazoo, Mich., is the changed name of the Clarage Foundry & Mfg. Co., which has operated for many years under the latter name, and whose fans are in use in practically all parts of the country, as well as in many foreign countries. A large number of the company's fans have been used in connection with stoker installations, where the requirements call for a comparatively high pressure and continuous operation and where the outfits are frequently installed in dusty locations. For this reason primarily and because it has been found


# CARRIER EQUIPPED

All the vital features are there, compactness, correctness, efficiency and moderate cost.

When you specify a Carrier installation, you specify the skill and engineering experience that have placed the Carrier Air Washer and Humidifier in a class by itself.

Used wherever air is to be conditioned.

Catalogue No. 13-36 is a text book on Air Washing and Humidifying. Sent postpaid upon request.

**Carrier Air Conditioning Company of America**

**39 Cortlandt St., New York**

**Buffalo** **Chicago** **Philedelphia** **Boston**

Sturtevant
(REG. U. S. PAT. OFF.)

NOTE THESE NOZZLES

Their construction explains why such a perfect spray is obtained in the

Sturtevant
(REG. U. S. PAT. OFF.)

# Air Washer

The large orifice strikes your attention at once—large lumps of foreign matter will pass through quite easily without the least sign of clogging. The orifice is the last word in simplicity—**A pipe with an unobstructed end.**

The spray action is obtained after the water has left the pipe.

This is the great distinction between the Sturtevant and other washers in which **the end of the nozzle is partly plugged up to obtain a spray.** These are apt to clog and require continual cleaning and attention.

Why not look up the other mechanical and operating advantages in catalog 225-V. It is sent on request.

## B. F. Sturtevant Company

**Hyde Park, Boston, Mass.**

**and All Principal Cities of the World**

to be by all means the best policy, the company has built only a high grade of fan equipment and this policy, it is announced, will be strictly adhered to. All Clarage fans are heavy, rigidly braced and have a reputation for being well built. The company feels that, owing to the growth of its fan business and because its line of fans has been developed to take care of the requirements in any field, the new name (Clarage Fan Company) is more indicative of the business which it is doing.

**Frank L. Patterson & Co.,** New York, reports that the new Equitable Building, New York, which is the largest office building in the world, will have in its mechanical equipment eight Patterson hot water heaters for furnishing hot water for domestic service. Each of these heaters will have an hourly heating capacity of 2,000 gals., heated from an initial temperature of 50° F. to a final temperature of 180° F., with steam at atmospheric pressure. The heaters will operate under a working pressure of 300 lbs. per square inch.

**Terry Steam Turbine Co.,** Hartford, Conn., announces the appointment of Earl F. Scott as manager for the State of Georgia, with offices in the Candler Building, Atlanta, Ga.; also that the company's Pittsburgh office is now located at 1624 Oliver Building, in charge of H. A. Rapelye.

**Standard Regulator Company,** New York, announces the opening of a Chicago office, to take care of its western business, at 1370 People's Gas Building, under the management of A. E. Atherton.

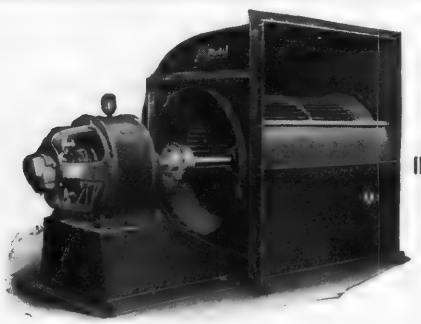
### New Incorporations.

**Harry Cooper Supply Co.,** Springfield, Mo., capital $75,000, to deal in heating and plumbing supplies. The company has taken a three-story building on East Water street, Springfield. Board of directors: Harry Cooper, Jr., Catherine E. Cooper and W. W. Carnagey, Jr.

**Sanitary Plumbing & Heating Co.,** Winchester, Ky., capital $2,000, to take over the business of T. J. Boone. Incorporators: W. E. Curry, T. J. Boone and H. H. Moore.

**Lewis S. Sandler Co.,** Lynn, Mass., capital $5,000, to conduct a heating and plumbing business. President, Louis B. Slovin; treasurer, Louis A. Sandler; secretary, M. Quinn.

**American Asbestos Mfg. Co.,** San Francisco, Cal., capital $1,000,000. Incorporators: W. B. Stone, E. E. Stone, J. A. Voorhees, C. W. Walter and R. R. Norton.

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## You should specify---

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TRADE MARK.

## Multi-Blade Fans and Blowers

1. **Because** they handle twice as much air, consuming less power than paddle wheel fans of same wheel diameter.
2. **Because** their design makes it possible for every bit of energy consumed; produce the maximum amount of air.
3. **Because** their high mechanical efficiency keeps their upkeep costs down to the minimum.

Bulletin No. 109 will be mailed at your request.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN U.S.A.

*Please mention* THE HEATING AND VENTILATING MAGAZINE *when you write.*

Wire to attack
The Eiffel Tower is now the central military wireless station of France. From it radiate the messages, the commands that direct the whole army of France battling on its 320-mile front. A breakdown in that station of any of the apparatus would mean little short of a catastrophe for the allied armies.
Sturtevant FANS
(REG. U. S. PAT. OFF.)
are relied upon by the French Government to keep the set in operating condition. They were bought at the outbreak of the war to cool and ventilate the powerful spark gap of this apparatus.
This is proof of the fact that the merits of Sturtevant Fans are realized by foreign experts who must have the best regardless of other considerations.
We have manufactured more fans during the last half century than all our competitors combined. Some of our fans have been running for twenty-five, thirty, or even forty years. Write for catalogs, mentioning this paper.
B. F. STURTEVANT COMPANY
Hyde Park Boston, Mass.
and all principal cities of the world
EIFFEL TOWER IN PARIS
AND ONE OF THE STURTEVANT FANS USED THERE

**Portland Vacuum Cleaning Co.,** Portland, Ore., incorporators: N. B. Wright, G. G. Irvine and J. M. Joice.

**Thermo Appliance Co.,** Sacramento, Cal., capital $200,000. Incorporators: A. J. Brown, D. W. Carmichael and S. J. Kenworthy.

**Farley Plumbing & Heating Co.,** Danville, Va., capital $4,000 to $15,000. President, F. K. Farley; secretary and treasurer, J. M. Ley, both of Danville.

**Reesh & Carter Heating and Plumbing Co.,** Mishawaka, Ind., capital $5,000, to deal in heating and plumbing supplies. Directors: Charles E. Reesh, Mildred Reesh and Wilford Carter.

**Iowa Foundry and Finance Works, Inc.,** Nevada, Ia., capital $200,000, to manufacture, sell and install heating plants of all kinds. Incorporators: L. P. Phillips, E. F. Dawson, H. W. Bowers, W. H. Paul, A. L. Dayton, T. J. Highley, and others.

**Union Heater & Supply Co.,** Fort Wayne, Ind., capital $25,000, to manufacture heating and plumbing supplies. Incorporators: Maurice Goldberger, M. Roth and F. M. Smith.

**Ryan Plumbing & Heating Co.,** Davenport, Ia., capital $25,000. President, J. J. Ryan; vice-president, H. C. Kahl; secretary and treasurer, J. Reed Lane.

### Contracts Awarded.

**P. J. Lavan, Seattle, Wash.,** heating and ventilating new Ballard high school in Seattle for $33,250.

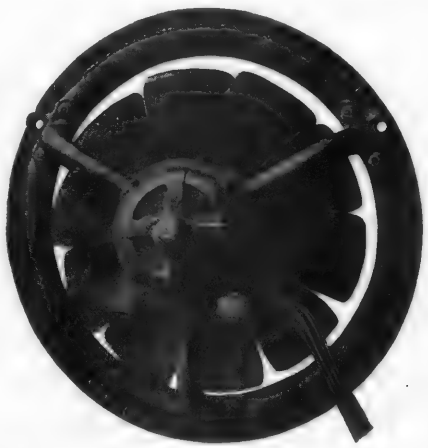
**George Karl,** Havana, Ill., heating aad ventilating new Pullen opera house at Havana, for $3,000.

**Merchants' Heat & Light Co.,** Indianapolis, Ind., has been awarded the contract for supplying heat, light and power to the court house, jail and other buildings maintained by the county in Indianapolis, for $13,989.24, covering the year 1915.

**Standard Plumbing Co.,** Fresno, Cal., steam heating Grand Central Hotel at Fresno. Steam for heating will be supplied from the new Fulton Building, so that when the new Fulton Building is ready for occupancy, the heating apparatus for the two buildings will constitute one system.

**General Heating & Ventilating Co.,** Milwaukee, Wis., heating and ventilating high school in Marinette, for $20,000; also heating and ventilating new high school at Prairie du Sac for $6,000, and at Tomah for about $6,000.

**Thomas Haverty Co.,** Los Angeles, Cal., heating, plumbing, refrigeration and automatic sprinklers for the new department



**Westinghouse-Ventura**
**Ventilating Fans**
possess the following special features:

**High Efficiency**—Note the special construction of the fan. This design, together with the high electrical efficiency of the motor, insures the movement of the maximum amount of air for a given amount of power consumed.

**Quiet Operation**—Suitable for use in churches, hospitals, etc., where noise would not be tolerated.

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**James Smyth Plumbing & Heating Co.,** Spokane, Wash., heating, plumbing and power piping for the Great Northern Railway Company's $800,000 hotel at Many Glacier's Lake, in Glacier National Park. This contract amounts to $80,000. This firm also has the contract for heating and plumbing the new machine shops and roundhouse for the O.-W. R. & N. Co., in Spokane.

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**F. E. Geisler & Co.,** Pittsburgh, Pa., heating, ventilating and plumbing new Y. M. C. A. building at Canton, O., for $24,586.

**Nash & Robinson,** Norwich, N. Y., heating the Empire Hotel at Gilbertsville, N. Y.

**Cleghorn Co.,** Boston, Mass., heating and ventilating Gordon de Luxe Theater in New Haven, Conn., the new Christian Science Church in Roxbury and the new Niles Building on School street, Boston.

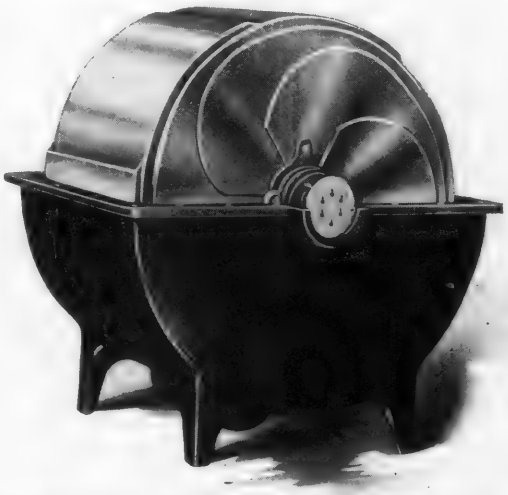
**Opperman & Hennessey,** Greenwich, Conn., heating, ventilating and plumbing school buildings in Greenwich, East Portchester, Stamford and Coscob, the contracts totaling $53,000.

**Alaska Plumbing Co.,** Portland, Ore., heating and ventilating Shattuck School in Portland for $24,000.

**Allen-Scales Engineering Co.,** Nashville, Tenn., heating and ventilating $75,000 high school building, Columbia, Tenn.

### Business Chances.

**Washington, D. C.**—Sealed bids will be received at the office of the Supervising



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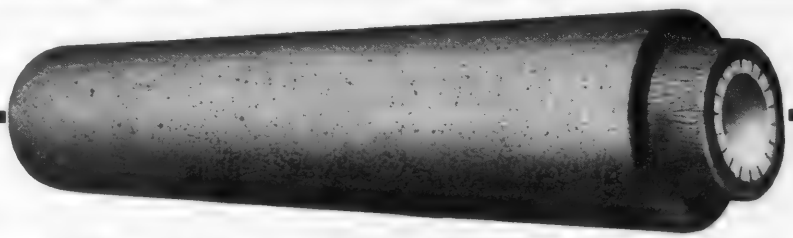

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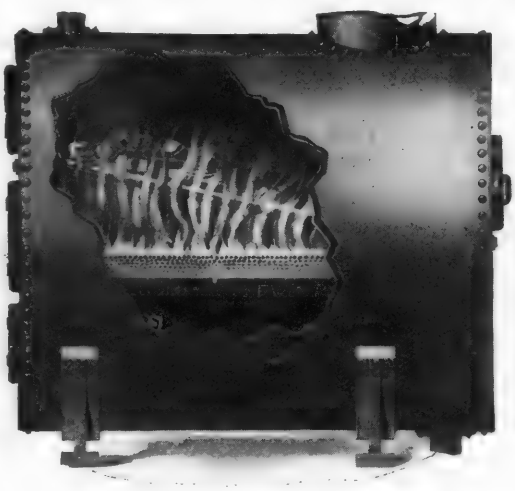

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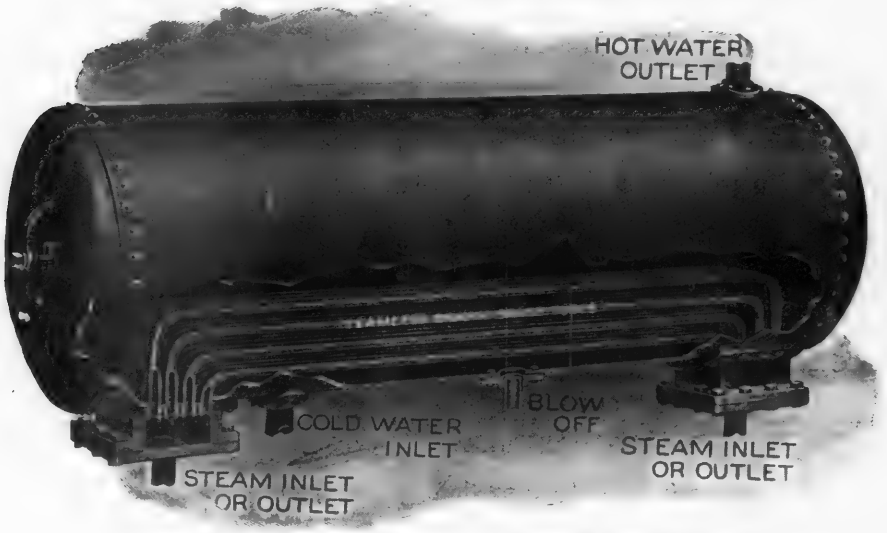


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have recently undergone a reorganization. Oliver S. Kendall, who founded the business in 1872, died last April and since then the business has been conducted by his son, O. S. Kendall, Jr. The new owners are William E. Mulvey and Ernest C. Mulvey. It is stated that the company has done a contracting business during recent years amounting to $100,000 per year.

### Trade Literature.

CENTRIFUGAL PUMPS is the title of a 64-page bulletin just issued by The Terry Steam Turbine Co., Hartford, Conn., giving details and data on various turbo-pump applications. The principles of operation and construction of the centrifugal pump are clearly explained, as are also the details of the steam turbines which have been successfully used during the past ten years for driving them.

DE LAVAL CENTRIFUGAL PUMPS are the subject of what is probably one of the most complete commercial publications devoted solely to centrifugal pumps published, which is being distributed by the De Laval Steam Turbine Co., Trenton, N. J. The book contains over 300 illustrations, including centrifugal pumps for all capacities and heads, and for motor and steam turbine drives. There are also diagrams showing "characteristics" of such pumps and explaining the relations between impeller blade angles and characteristics. Part II. is devoted to the important features to be considered in selecting centrifugal pumps, while Part VIII. is devoted to the speed question, principally as relating to direct connection of centrifugal pumps and steam turbines. Size 6x9 in. (standard). Pp. 298.

COCHRANE MULTIPORT VALVES is the title of a new booklet issued by the Harrison Safety Boiler Works, 3189 North 17th Street, Philadelphia, in which is described the company's line of multiport valves for back pressure, relief and vacuum service, flow service in connection with mixed flow turbines, and check


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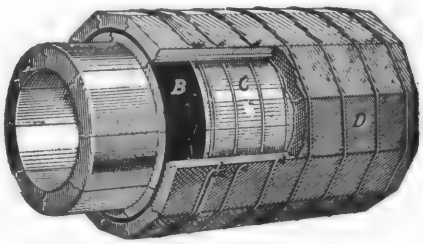


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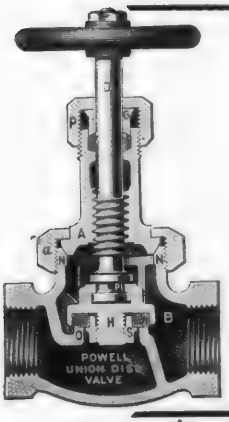


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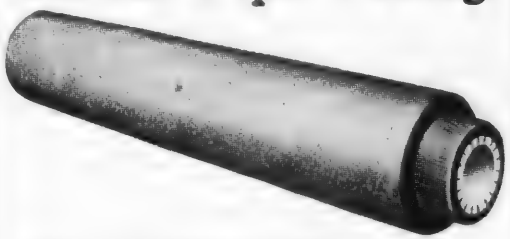

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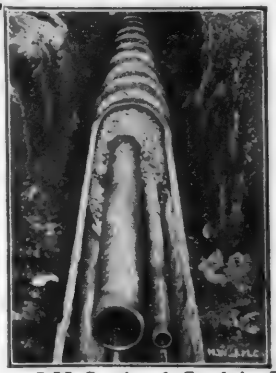

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valve service with bleeder or extraction turbines. As its name implies the essential idea of the multiport valve is the use of a number of small discs instead of one large disc, in order to secure greater safety, quietness, lightness of moving parts and tightness. In addition to full descriptive and tabular matter, the book contains numerous diagrams and layouts, also data on the effects of air in condensers and upon turbine performance. Size 6x9 in. Pp. 72.

STANDARD SYSTEM OF TEMPERATURE AND HUMIDITY REGULATING DEVICES is the subject of a new booklet, issued as a perpetual catalogue by the Standard Regulator Co., New York, manufacturers of temperature and humidity regulation and pneumatic switch control apparatus, hot water regulators and damper regulators. The catalogue covers in detail the company's products, giving the necessary data for quick and easy reference. Attention is called to the fact that for over fifteen years Standard thermostats and regulating devices have been used successfully for the control of temperatures and pressures. A section of the catalogue is devoted to the company's line of Victor regulators for the control of hot water temperatures, steam and hot water boiler drafts, steam pressures, fan engine control, etc. Size 5½x8¼ in. Pp. 40.

IT PULLS is the title of a catalogue devoted to the Kernchen Siphonage Ventilator, manufactured by the Kernchen Co., McCormick Building, Chicago, Ill. This ventilator is described as without an equal for factory ventilation and the catalogue includes some impressive illustrations of factory buildings, showing the many Kernchen ventilators in use, the statement being made that in many cases they replaced other types of ventilators. This device was placed on the American market in 1910. Among its features of advantage is mentioned the point that it has at least 100% more exhaust than any other ventilator. It is guaranteed storm-proof and has no loose parts and also is not rotary. Included in the catalogue is a report of an official test made by the Armour Institute of Technology, Chicago, showing the exhaust of the Kernchen ventilator at different outside wind velocities, and also a test made by the Case School of Applied Science in Cleveland, both of which show the marked efficiency of this ventilator. Size 3¾x8 in. Pp. 16.

VACUUM HEATING SYSTEMS, including air line and return line systems, are treated in a notable catalogue published by the Fischer Sweeney Bronze Co., Hoboken, N. J. The catalogue opens with a timely article on the comparative merits of vacuum heating, written by Prof. R. C. Carpenter of Cornell University. The catalogue then takes up the different methods of installing vacuum heating systems, showing typical plans of each system. Following this is a detailed description of the apparatus used with the F. S. B. systems, including the turbine ejector pump for air line systems, the Paul steam and water exhausters for air line systems and the turbine ejector pump for return line systems. The construction and operation of the B. V. M. bronze thermostatic steam trap and check valve is presented in an interesting manner. The back portion of the catalogue contains numerous pictures of buildings equipped with F. S. B. vacuum heating systems. Size 6x9 in. (standard). Pp. 56.

BEACH-RUSS VACUUM CLEANING OUTFITS are described in newly-issued circular matter issued by the Beach-Russ Co., New York. The pump used with this system is of the rotary type. The company calls attention to the fact that it has manufactured vacuum pumps and vacuum apparatus for the past fifteen years.

HEATING THE LARGEST PIER IN THE WORLD is the title of a reprint of an article in *Power* that is being sent out by the B. F. Sturtevant Co., Hyde Park, Mass., describing the installation for the Commonwealth Pier No. 5, at South Boston, Mass.

ENGINEERS' BULLETIN for testing, connecting and operating the Sparks Style F pump and system of vacuum heating is a recent publication of the Automatic Vacuum Pump Co., 442 Wells Street, Chicago, Ill., which contains much useful information for the proper installation of this system. Directions are given for testing the heating system, testing air lines, location of vacuum pump, connections to pump, adjusting air valves, vacuum carried on air lines, water connections, steam pressure necessary for operating the Sparks pump, regulating pump strokes and testing pump. A diagrammatic view is included of the Sparks automatic vacuum pump, with all of the various parts carefully numbered and named. Another diagram shows a typical method of installing the pump. This catalogue is supplementary to the "Specification Bulletin," previously issued by the company. Size 6x9 in. (standard). Pp. 8.

IDEAL HEATING JOURNAL for January, 1915, the monthly periodical of the American Radiator Co., Chicago, Ill., contains an article on "A New Field for the Modulating Valve," by S. Homer Woodbridge, A. M., in which he discusses the use of a proper form of modulating valve in connection with hot water service with a view of placing such service on a par with steam heating in several particulars which he notes.

GREEFF SYSTEM OF DRYING, adapted to varnishes, veneer, shellacs, glues, macaroni, patent leathers, lumber, fruits, etc., manufactured by the Greeff Engineering and Mfg. Co., 16 Lawrence St., Newark, N. J., is described and illustrated in a new bulletin. The illustrations include typical installations. The company states that no wall coils are used, nor cold water condensing pipes or false floors. Neither is high pressure steam necessary. The system is described as one whereby washed and humidified air is forced into the kiln at varying temperatures best suited for the material to be dried. Size 9 by 10¾ in. Pp. 8.

A COOLER BOOTH, featuring the Sturtevant telephone booth ventilator, is the title of an interesting booklet published by the B. F. Sturtevant Co., Hyde Park, Boston, Mass. The illustrations show the way in which these sets are adapted for ventilating telephone booths, and the statement is made that such hotels as the Ritz-Carlton in New York, the Brevoort in Chicago and the Lafayette in Buffalo have adopted the Sturtevant ventilator. This apparatus can be easily installed, the weight of the ventilator complete being 7 lbs. It is listed at $35.00. Size 3½ x 6½ in. Pp. 10.

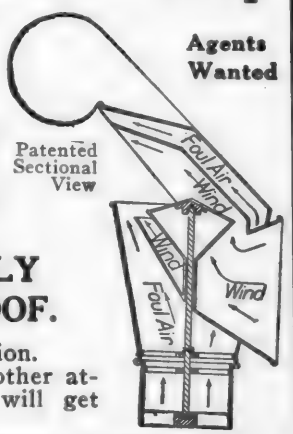
TYLER CONDENSATION METERS for central station work are featured in circular matter that is being sent to the trade by the Tyler Underground Heating System, Pittsburgh, Pa. These meters are designed to operate with any type of vacuum heating system. Special attention is called to the size and construction of the sediment chamber, thereby eliminating the screen. The sediment chamber is provided with a baffle plate to prevent dirt, scale and other obstacles from passing into the meter. The upper portion of the meter is provided with a storage chamber to check any sudden flow of water that may occur in the meter. The manufacturers state that they are prepared to manufacture these meters with from 20,000 to 200,000 lbs. capacity, guaranteed to measure accurately to within one-half of 1%.

EMPRESS BOILERS, made by the International Heater Co., Utica, N. Y., are featured in a recent catalogue, containing among other things a number of convincing testimonials from satisfied users. These letters are accompanied by others from master steam fitters showing their satisfaction, as well, with this type of heater. The views showed the construction of the boiler in detail, the catalogue concluding with a table of capacities, etc., for steam and water. In connection with a view of the company's plant at Utica, it is stated that the plant has a total length of 2,282 feet, or nearly one-half mile, while the floor space is 307,950 sq. ft., or over 7 acres. Size of catalogue, 6¾x9¾ in. Pp. 16.

MARSH REFLUX RETURN LINE VALVE, for low pressure, vapor and vacuum heating systems, are treated in new circular matter published by Jas. P. Marsh & Co., Chicago, Ill. The diaphragm of the valve operates through the vaporization and condensation of volatile liquids contained within it, this fluid revervoir being a special feature of the valve. Together


**American Standard Automatic Air Pump**

Having a Special NO-DOWN-DRAFT feature, it insures a steady upward pull at all times.




Patented Sectional View

**Agents Wanted**

**ABSOLUTELY STORMPROOF.**

Needs no attention.
Has no fans or other attachments that will get out of order.
Will give an average displacement at the rate of over 1000 linear feet per minute.

**Specified by the New York and Massachusetts Boards of Education.**

**Century Ventilating Co.,**
**73 Guernsey St., Brooklyn, N. Y.**

*Your Choice of Seven Types*
*is offered in our line of*
**Standard Recording Thermometers**
**We make a specialty of hot water and steam indicators**
*Send for Catalogue VH*
**Standard Thermometer Co., Clifton and Shirley Sts., Boston, Mass.**

with the composition seat, it relieves the force of the expanding member. The reservoir is really a tube containing, with the diaphragm, the volatile fluids.

MUELLER TAPPING MACHINES, for tapping water mains under pressure and inserting corporation cocks without shutting off the water in the main, are the subject of newly-issued circulars sent out by the H. Mueller Mfg. Co., Decatur, Ill. The enduring qualities of the machine enable the manufacturers to state that the cost of the device is but one cent a day. The machines are made in three sizes.

DIRECT CURRENT MOTORS, Types C and D, are covered in a new bulletin (No. 41010) published by the Sprague Electric Works, New York. The catalogue contains full details, with dimensions, of this line, supplemented by an interesting array of typical installations for a variety of purposes. Size 8½ x 11 in. (standard). Pp. 20.

FORD STEAM AND WATER SPECIALTIES, made by the Thomas P. Ford Co., Inc., 407 Broome St., New York, is the title of a complete catalogue and price list of this company's product, which includes damper regulators, steam traps, reducing valves, pump governors and pressure regulators, balanced tank valves, back pressure valves, controlling devices and relief valves. Illustrations are included of each device, accompanied by descriptive matter and price lists.

VAN AUKEN SYSTEM OF VACUUM HEATING is featured in new circular matter published by the Thermograde Valve Company, Boston, Mass. A number of the more important installations are given and details are included of the Belvac thermofier, which is shown in sectional view.

### Estate of Richard T. Crane Valued at $6,770,394.

The estate of the late Richard T. Crane, president of Crane Co., Chicago, according to the final accounting, consists of personal property valued at $6,770,394. The will provides that the two sons shall pay to their mother, Mrs. Emily Hutchinson Crane, $15,000 a year.

### Meeting of Central Supply Association.

The next general meeting of the Central Supply Association will be held in Chicago, Wednesday, February 24, 1915. The executive committee, as usual, meets on the day previous. Headquarters will be at the Auditorium Hotel.


**Other Vacuum Cleaners Have Come and Gone, But**

# The SPENCER Turbine

**Low Velocity**
**Wide Clearance**

¾H.P.Equipment

Has staid through all and remains, the Champion of High Standards and Liberal Rating.

They have more successful large installations, in such skyscrapers as the Woolworth, the Bankers Trust, and the New York Municipal Building; in such residences as Castle Gould, Mrs. E. H. Harriman and Mr. C. S. Woolworth, and in such institutions as Yale, Harvard and Cornell Universities, than all others combined.

**The Spencer Turbine Cleaner Company**
**Hartford, Conn.**

**A Notable Air Washer Catalogue.**

An important addition to the literature on air conditioning and air conditioning apparatus has been made by Warren Webster & Co., Camden, N. J., in the publication of a new illustrated booklet devoted primarily to the Webster air conditioning apparatus. The first part of the booklet is taken up with specification forms covering each type of apparatus. These specifications, it is stated, are the result of the company's extensive experience in this line of work during the past seven years. Particular attention is also paid in the booklet to the Webster system of humidity control and the specifications in this connection include conditions where no reheater is interposed between the air washer and the fan and when such reheater is interposed. A dozen or more pages are given over to "Notes on Hygrometry," the remaining pages being taken up with photographic reproductions of apparatus and typical installations. This book will be found especially useful when specifying the various types of Webster air conditioning apparatus with the assurance of securing the best results for specific requirements. It is gotten up in an unusually attractive manner and is profusely illustrated. Size 6x9 in. (standard). Pp. 88.


MOUAT
Graduating Vapor
Heating System

**Steam and hot water systems can be changed to the Mouat Vapor Heating System by any good plumber or heating contractor.**

**Here Is a Good Field for Sales**

The Mouat Graduating Vapor Heating System enables you to make business where there was no business before.

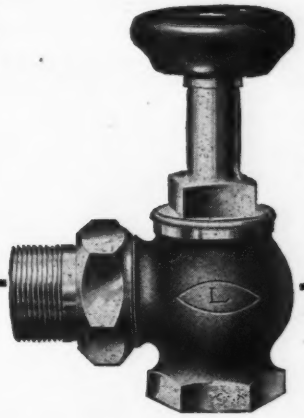
Write for Booklet, on your business letterhead, and we will give you additional information on how to get this business.

Ask us for our generous proposition to Heating Contractors.

**The Mouat-Squires Co.**
**1244 W. 4th St., Cleveland, O.**

MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount





***Insist on the LAVIGNE***

Its correct design, shapely appearance, and efficient action stamp the

**Lavigne Packless Quick-Opening Steam Radiator Valve**

as the leader of its class.

*Why experiment, when the valve with a reputation is at your service?*

Lavigne Packless Steam Valves will positively control the heat in vapor, vacuum or central heating systems. They positively will not leak air, water or steam and will positively completely open or close with seven-eighths turn of the handle.

*Ask your Jobber or write for details*

**Lavigne Mfg. Company**
**Detroit, Mich.**

# Tycos Temperature Instruments

The *Tycos* Mercury Operated Recording Thermometer

## H & M Type Thermometers

**Tycos Mercury Operated Steel Construction Recording Thermometers**

**Automatic Temperature and Pressure Regulators**

**All Glass Engraved Stem Thermometers**

**Hygrodeiks and Hygrometers**

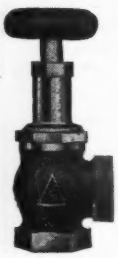
**Thermo Electric and Radiation Pyrometers**

The H&M Division

*Taylor Instrument Companies*

Rochester, N.Y.

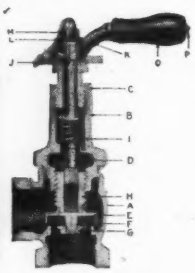
H & M Type Straight Thermometer with Thread Connection



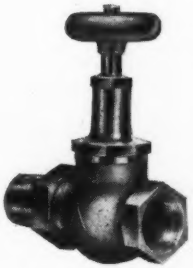
# SYRACUSE PACKLESS RADIATOR VALVES

Can be used on any kind of a heating system in any kind of a building where steam or hot water radiators are used.

# IT IS WORTH WHILE



To specify and use a valve that will give satisfaction from the start. They are simple in construction, efficient in service, neat in design, guaranteed to users to do all we claim. Our circular gives details. Send for it.

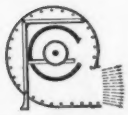


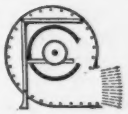
## SYRACUSE FAUCET AND VALVE CO.

Office and Factory
Syracuse, N. Y.

220-224 West 42nd St.
New York City

GEO. A. WELD CO., 79 Milk St., BOSTON




# Announcement

*The Clarage Fan Company is a new name for an old company. Having operated for years under the name of the Clarage Foundry & Manufacturing Company, we have built fans and shipped them to all parts of the United States and to many foreign countries.*

*A large number of our fans have been used in connection with stoker installations, where the requirements call for a comparatively high pressure, where continuous operation was of vital importance and where the outfits were frequently installed in dusty locations. For this reason primarily, and because we have found it to be by all means the best policy, we have built and will build, only a very high grade of fan equipment. The Clarage Bearing is, without question, the best fan bearing on the market today, and all Clarage fans are heavy, rigidly braced, and well built. Connected with the company are men whose experience in the fan business has extended over a period of thirty years.*

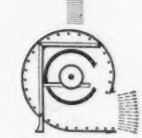
*Owing to the continued growth of the fan business, and because our line has been developed until we are now in a position to take care of the requirements in any field, we feel that the new name, the Clarage Fan Company, is more indicative of the business which we are doing.*

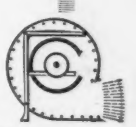
**CLARAGE FAN COMPANY.**

HEATING, VENTILATING & DRYING ENGINEERS.

KALAMAZOO—MICHIGAN—U. S. A.

**Eastern Branch, 149 Broadway, New York, N. Y.**




*Please mention* THE HEATING AND VENTILATING MAGAZINE *when you write.*

# Better than "burn our own smoke"

Said a great American writer: "The first lesson in life is to burn our own smoke; that is, not to inflict on outsiders our personal sorrows and petty morbidness"—in other words, to destroy the useless by-products of human nature. It is about the same in using the nation's unlimited supply of soft coal. It contains available winter comfort for buildings without number—if only it can be burned without deluging the community with smoke, soot and grime. This is now done in hundreds of buildings by the

## IDEAL Smokeless Down-Draft Boilers

which go one better than the writer's advice; they do not "burn the smoke"—they burn cheap soft coals completely, and *prevent any smoke from forming.* The rich heat-making gases (which in old-fashioned heating apparatus escape up the chimney with the smoke, unburned) is turned into heat. The result is that property-owners who use IDEAL SMOKELESS Down-Drafts obey the law of good neighborliness and all city anti-smoke ordinances, help promote a clean community life, obtain all the heating effects which hard coal produces, and with annual fuel bills strikingly less than for any other fuel used for heating.

Showing water grate and big gas-burning chambers of a moderate sized IDEAL SMOKELESS Down Draft Boiler

Try a few of the IDEAL SMOKELESS Down-Draft Boilers for heating apartments, large homes, hotels, churches, schools, public buildings, etc. They help increase the good will of architects and heating men in all fields that are insistent in the demand for clean chimney-tops and pure air. Write for special Down-Draft Boiler catalogue.

## AMERICAN RADIATOR COMPANY

Public Showrooms at Chicago, New York, Boston, Providence, Philadelphia, Washington, Baltimore, Rochester, Buffalo Pittsburgh, Cleveland, Cincinnati, Detroit, Atlanta, Birmingham, New Orleans, Indianapolis, Milwaukee, Omaha, Minneapolis, St. Paul, St. Louis, Kansas City, Denver, Seattle, Portland, Spokane, Los Angeles, San Francisco, Brantford (Ont.), London, Paris, Brussels, Berlin, Cologne, Milan, Vienna